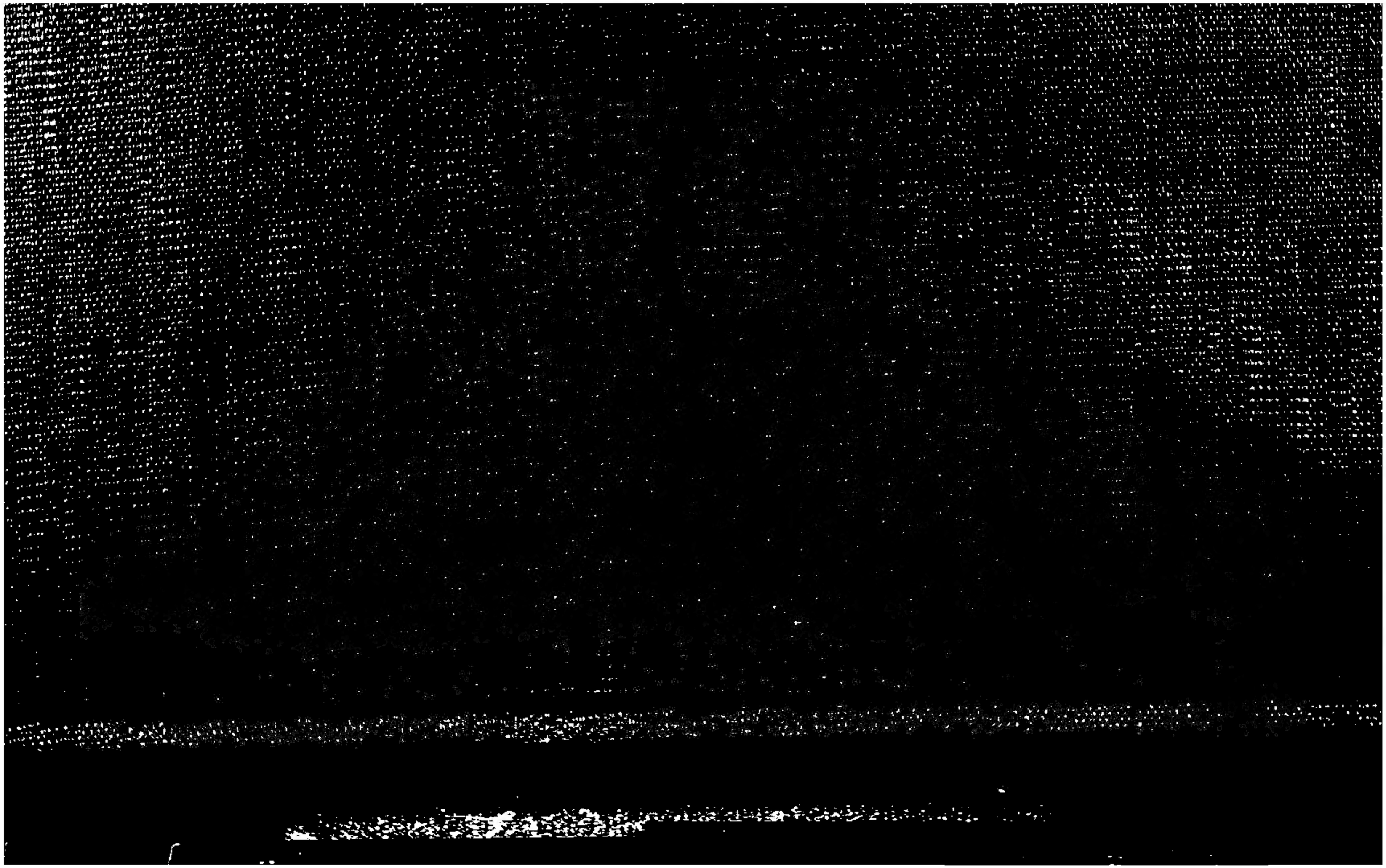

JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD
EDITOR

VOLUME 43

1942

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JOURNAL

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

THE GARDEN AND THE WAR

THE impact of a nation at war is felt by every institution, public and private The New York Botanical Garden is no exception.

Fifteen of our men, representing 14 percent of the total, are already in the armed forces of the United States. Fifty of our force have qualified as air wardens or as auxiliary fire wardens, and others are in training as nurses' aids at work in the Red Cross and similar agencies.

There are ways in which every institution contributes to the war effort, but a botanical garden, because of its peculiar qualifications, has unique contributions to make. The interruption of trade and transportation has brought unexpected demands not only on the specialized knowledge of the staff, but also on some of the unusual plant materials under cultivation here.

The Garden's ornamental plantings and displays also have their function, for even more in wartime than in peace, a public garden is an important factor in furnishing relaxation and maintaining morale.

Food is a war weapon, and so the Botanical Garden has instituted a special program of courses in vegetable gardening. These courses will not encourage the inexperienced and over-enthusiastic to engage in unwise gardening, but through sound instruction given by highly qualified men, they will contribute to the conservation of land, fertilizers, and human effort, as well as to the production of nourishing food

We have confidence in the future and will continue to serve individually and as an institution in any way we can

William J. Robbins

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Practical Vegetable Growing For Amateur Gardeners

By James S. Jack

THE family that grows its own vegetables for the table will be among the fortunate ones this year, for, if the garden is planned well and given proper care, an abundance of nutritious food of the finest quality will be provided for many months.

Anyone having a reasonably good piece of land may successfully indulge in vegetable gardening. A plot 50 x 100 feet should be large enough for a family of from four to six persons, and will provide ample vegetables from early spring until late fall. Even a strip one tenth that size will serve a useful purpose if it is sown to vegetables.

To be suitable for vegetable growing a piece of ground requires plenty of sunshine. So do not plant vegetables under trees or in the shade and expect results. They cannot survive a struggle both for sunlight and for food.

Preparation of the garden is important, and when possible it should be started in the late fall, rather than in the spring. But let this not discourage those whose inspiration comes in March or April, for good vegetables can still be grown if the ground is given proper treatment.

How to Prepare the Ground

First of all, where manure is available it should be used, for it will make the results of the garden much more satisfactory. Cow manure is preferable although rotten horse manure is also good. It should be spread to a depth of 3 to 4 inches over the garden in the late fall. When possible, a dusting of 20% superphosphate over the manure will greatly benefit the ground. This is a very cheap fertilizer which I highly recommend, and most ground in and around New York City lacks phosphates.

You are now ready to start digging. Proceed by taking out a trench the depth and width of your spade, and deposit the soil at the other end

of the ground to be dug. When digging put your spade into the earth as far as possible, as the deeper ground is dug the better will be the crop. Now put the manure that is on top of what will be your second trench into the bottom of the first trench. Dig the second trench (which adjoins the first) the same width and depth as the first, and turn the soil from it over the manure in the first trench. The second trench, in turn, receives the next lot of manure, which is to be covered by the soil from the third. In this manner all the manure will be buried several inches deep, out of the reach of seed and seedlings, where it will continue to rot and do its work later in the season.

If you have a piece of sod land or a field that you wish to make into a garden, it is quite essential to prepare the ground in the fall so that the turned-over sod will have a chance to rot. The procedure will be the same as for digging a ready-made garden, except that the trench should be at least a foot deep and a foot wide. Skin off the sod, place in the bottom of the trench with the manure, and cover with the soil that was lying just beneath the sod. In this manner the sod is buried out of the way, yet where it will be available later for plant food.

While the manure I have recommended should be dug into the garden in the fall or spring, preferably the fall, an artificial fertilizer can be used to advantage during the period of growing. If manure can not be used, some other sort of organic material should be incorporated with the soil in the bottom of the trench.

When a commercial fertilizer is used during the summer, the method of application is to dust it lightly along the rows about once a week. This is to be followed by a loosening of the soil with a garden cultivator, thus permitting the fertilizer to mix with the soil, where it does the most good. If the fertilizer is applied just before a rain, its immediate usefulness is multiplied several times because the water dissolves it and makes it available at once to the roots of the plant. In the event of no rain, a sprinkler will achieve the same results. There are several good commercial vegetable fertilizers available that carry nationally famous names, and are advertised extensively. Buy at reliable stores and you will receive reliable products beneficial to your garden.

Buying and Sowing the Seed

The same advice applies to the purchase of seed as to the purchase of fertilizers. Patronize an established seed store. The initial cost of the seed may be more, but will pay dividends before the end of the season. Seeds do not germinate 100% if kept over from one year to another, so go to a seed store whose reputation has been made by quality, and where you can be assured of tested seeds from the most recent crop.

As to the amount of seed to buy for your garden, it is rather difficult

For a Successful Crop

1. *Choose a sunny spot for the vegetable garden.*
2. *Prepare the ground thoroughly, preferably in the fall.*
3. *Buy your seeds (also fertilizers) only from reliable dealers.*
4. *Buy young plants, if possible, from the place where they are grown.*
5. *Plan for periodic sowing of seeds to insure supplies of fresh young vegetables throughout the season.*
6. *At the end of each row place a label giving the date of sowing and the name of the variety.*
7. *Keep the ground well cultivated.*
8. *Keep weeds under control.*
9. *Use rotenone against insect pests.*
10. *In the fall, clean up the vegetable garden and turn the soil so that it will pass the winter in a rough condition.*

to set a definite quantity, but do not buy large amounts. A reliable seed store can help you in this matter, as you may desire more of certain kinds than of others.

The garden now being dug, it should be raked with a garden rake to remove large stones and to make it smooth. The degree of smoothness required depends on the size of the seed to be planted. The smaller the seed, the finer should be the seed bed.

The method of making drills for sowing also varies with the size of the seed. Small kinds, such as carrots, beets, spinach and onions, do not need a deep drill. The simplest method is to measure off the rows by thrusting a stick into the ground at each end and stretching a garden line between them. Now take a square stick, such as a dahlia stake, about 6 feet long and 1½ inches square. Cut a long notch on one end and insert the garden line in the notch, then push the stake along the line. This leaves a drill 1½ to 2 inches deep, and is about the proper depth for all small seed. Larger seed, such as string beans, peas, corn and lima beans, should be sown a little deeper. The method for making a drill for them is to take the corner of a garden hoe and draw it down the garden line, taking out soil to a depth of about 3 inches.

Now sow the seed in the lines, being careful not to let it fall too thickly. Use a cereal dish to hold small seed, and sow by taking up the seed with your first three fingers, then letting it filter through your fingers into the drills. In this way you keep control of the quantity, and can avoid having it too thick. The drills are easily filled in after sowing by

taking the back of a wooden lawn-rake and drawing it over the bed parallel to the seed lines.

Important to remember is this: Put in a garden label at the end of each row, telling the variety of seed and the date sown, so that you can check dates for succession sowings.

In planning the garden, tall growing vegetables such as corn and tomatoes should be kept in patches by themselves so that they will not shade smaller-growing varieties.

What Kinds of Vegetables?

There is a great selection available of kinds of vegetables and many varieties of each kind, but I strongly urge the growing of those that will produce in good quantity, and preferably at least two varieties of each kind Those that I recommend are as follows:

String Beans, **Masterpiece**
Lima Beans, **Dwarf Bush**
Beets, **Detroit Dark Red**
Broccoli, **Italian Sprouting**
Cabbage, **Early Jersey Wakefield**
" **Medium Early Flat Dutch**
" **Late Danish Ballhead**
Carrots, **Danvers Half-long**
Corn, **Golden Cross Bantam**
" **Stowells Evergreen**
Kohl-rabi, **Early White Vienna**
Lettuce, **Big Boston**
" **Matchless**
Onions, **Yellow Globe Danvers**
Onion Sets, **Ebenezer** or **Japanese**
Parsley, **Emerald Gem**
Garden Peas, **Early English Improved Early Bird**
" " **Midseason Gradus**
" " **Dwarf Alderman**
Radish, **Early Scarlet Forcing**
Spinach, **Viroplay Thick-leaved** (for spring and fall)
" **New Zealand** (for summer)
Tomatoes, **Stone**
" **John Baer**
" **Ponderosa**

To insure a young crop always ready for use, it is necessary to make several sowings of some of the foregoing seeds. Vegetables that are old and hard are not particularly appetizing, therefore sow one line at a time and sow additional lines at periodic intervals. Those to be sown 10 days apart would be string beans, corn, radishes, and spinach (spring and fall), and those at intervals of 20 to 30 days would be beets, carrots, kohl-rabi, and lettuce. Garden peas, onions, and bush limas can all be sown in April at one sowing. See the chart for distance apart of rows for the foregoing seeds.

Plants that are available to persons with a greenhouse, or that can be bought in the spring, are eggplants, tomatoes and peppers. Care should be exercised in buying greenhouse plants, for often they are long and spindly, and if so, should be avoided. Short stubby ones produce much better results. I suggest buying at the source of supply rather than on the sidewalk.

PLANTING CHART FOR VEGETABLES

Seed	*Depth for Sowing*	*Distance Apart for Rows*	*Directions*
Beets, Kohl-rabi, Lettuce, Onions, Carrots, Parsley, Radish, Spinach (spring and fall).	1″ —1½″	12″	Thin seedlings, if they seem to come up too thickly, to about ½″ apart; lettuce 6″.
New Zealand Spinach, String, Bush, and Lima Beans	2½″—3″	20″	After growth thin beans out to about 4″ apart in rows.
Garden Peas, Corn	3″	40″	Sow quite thickly Thin corn after it is 3″ or 4″ high to about 12″ apart, leaving 3 or 4 plants together.

Plant	*Distance Apart of Plants*	*Rows, Distance Apart*
Broccoli	18″	24″
Cabbage	18″	24″
Onion Sets	1″	12″
Tomatoes	40″	40″

Cultivation and Weeding

Two very important duties in growing vegetables are: Keep the ground cultivated and keep the weeds under control. The first is a great help in handling the second. There are several good types of garden cultivators available at your hardware store, and a cultivator is a worth-while investment. Cultivation, which means loosening of the earth two or three inches deep between the rows of vegetables, also helps to conserve the moisture in the ground during dry spells, and makes it porous after rains. Both are necessary for plant development. Also, as has been said before, cultivation is helpful after dusting of artificial fertilizers between the rows in that it places the fertilizer where it can reach the plant roots most quickly.

Safe Control of Pests

Insects are certain to be found doing damage in the vegetable garden. The Mexican bean beetle is easily controlled by dusting the beans as soon as it is seen with rotenone dust, which is non-poisonous. This same dust will be found useful in repelling and killing other insects in your garden, such as cabbage worms, corn-ear worms, etc. The dust should be applied during early morning while the plants are still damp, as the dew holds it to the leaves. An application should be good for about 10 or 12 days unless it rains, in which case it should be done again after the rain stops. Apply the dust with a powder duster and get it on the underside of the leaves, as that is where most insects work. For control of the corn-ear borer, concentrate on putting the dust on the ear silk just as soon as it

forms, and continue dusting every 10 days until time for pic' .g the corn has arrived. Avoid sprays with poison ingredients as the danger of poisoning is great and is unnecessary.

The End of the Season

As vegetables get too old for table use, remove them from your garden and pile them in a refuse heap to rot with leaves and other rubbish you may gather. This makes good material to incorporate into the garden when spring digging takes place. Carrots and beets can be taken up in the fall and stored in a cool cellar, burying them in sand and using them as needed.

Your garden should be cleaned up in the fall, redug, and left in a rough condition for the winter, as the cold and snows are beneficial to the ground.

Victory Program in Vegetable Gardening

The remainder of this and the following page are taken from a leaflet being distributed to members of the Botanical Garden and others to acquaint them with the Garden's new program of Victory Courses in Vegetable Gardening.

Every productive vegetable garden contributes to our national well-being and is an aid to Victory. The New York Botanical Garden announces in addition to its regular Educational Program the following Victory Courses in Vegetable Gardening. Every course will be taught in a thoroughly practical manner by qualified instructors—men who themselves are engaged in growing quality vegetables.

VICTORY THREE-DAY SHORT COURSE IN VEGETABLE GARDENING

Intensive instruction in the planning, planting and maintenance of the home vegetable garden will be taught in a series of lectures and demonstrations. The topics will include Planning the Garden, Selection of Varieties, Soil Preparation, Seed Sowing, Planting for Succession, Summer Care, Harvesting, Storing and the Culture of Individual Crops.

This course differs from the "Three-Day Short Course in Practical Gardening," which forms part of our regular Educational Program, in that the planning of the garden and cultural directions for the cultivation of specific vegetable crops will be covered. The students will receive demonstrations on how to prepare soil, sow seeds etc., but they will not be called upon to do this work themselves as part of the course. They will, however, be expected to prepare a plan of a vegetable garden (of their own garden, if they so wish) and this will be returned to them with appropriate criticisms.

The class meets for six sessions on Monday, Tuesday and Wednesday, March 30, 31 and April 1, 10:30 a.m. to 12:30 p.m. and 2:30 to 4:30 p.m. daily.

Fee: $10.

Lecturers—Mr. Edwin Beckett
Mr. George H. Gillies, Mr James B. Jack
Mr. Thomas Little, Mr. Francis Paterson
Mr. James G. Esson, Mr. John Watts

Minimum registration: 25

VICTORY EVENING COURSE IN VEGETABLE GARDENING

This course will consist of 12 lectures, each of one hour's duration, given over a period of six weeks. The instruction is essentially the same as that offered in the course in "Vegetable Gardening" which forms part of our regular Educational Program and which begins on January 19, 1942. It covers Choice of Site, Garden Layout, Soil Preparation, Manuring and Fertilizing, Selection of Varieties, Planting for Succession, Care through the Growing Season, and the Harvesting and Storing of Crops. The use of hotbeds and coldframes is covered and the cultural requirements of individual crops are discussed in detail.

Two lectures will be given each Thursday evening from Feb. 19 to Apr. 2 (excluding Mar. 19), 7 to 9 p.m.

Fee: $10.
Minimum registration: 20

Lecturers—Mr. James B. Jack
Mr. Arthur King

VICTORY COURSE IN VEGETABLE GARDEN MANAGEMENT

This course will consist of six lecture periods given in the Museum Building at the Garden followed by ten demonstration and observation periods in a vegetable garden of outstanding merit. The lecture periods will be given on Fridays, 2:30 p.m. to 3:30 p.m., from Feb. 20 to Apr. 3 but omitting Mar. 20. The demonstration periods will be held at 2:30 p.m. on the first and third Fridays of each month beginning Apr. 17 and continuing to Sept. 4.

The demonstrations will be given simultaneously by Mr. James G. Esson in the garden of Mrs. Roswell Eldridge of Great Neck, Long Island, New York, and by Mr. James S. Jack in the garden of Mrs. Flagler Matthews of Brookside, Ridge Street, Rye, New York.

Individual students may elect to attend the demonstrations at whichever garden is the more convenient, but not more than 25 students can be accommodated in either group. Students will make their own arrangements for transportation to and from the garden selected.

The instruction given in the lectures will cover the Selection of a Site, Planning of the Garden, Soil Preparation, and Cultural Directions for Individual Crops. At the demonstrations the students will be instructed in the 'why' and 'how' of the seasonal operations connected with vegetable cultivation.

Fee: $15.
(Minimum registration in each group 15)

Instructors—Mr. James G. Esson
Mr. James S. Jack

VICTORY COURSE IN VEGETABLE GROWING

Beginning Jan. 28, two identical courses of six lectures each will be given in co-operation with "The New York Times": one on Wednesday afternoons at 2:30, the other on Wednesday evenings at 8. These courses are free. They are given in the New York Times Hall, 240 West 44th Street, New York City. Admission will be by ticket only. Application for tickets must be made to Mr. F. F. Rockwell, Garden Department, "The New York Times."

The lectures will concern the planning and preparation of the home vegetable garden and its care and maintenance.

No fee.

Instructors—Mr. T. H. Everett, Mr. George H. Gillies
Mr James B. Jack, Mr. James S. Jack
Mr. Arthur King, Mr John Watts

The Cultivation Of Mushrooms

By G. Raymond Rettew

TO the person who visits a flower show or reads the ads in magazines, it appears that to grow a crop of mushrooms at home in the cellar or woodshed is simply a matter of planting a bit of manure that has been inoculated with mushroom spawn, then waiting for the mushrooms to appear.

The amateur may be rewarded with a small crop, and no doubt many commercial growers started in this way. But to be assured of continuous production of good plants requires a control of conditions which can only be undertaken by a specialist who has both the knowledge and equipment to meet the demands of the industry.

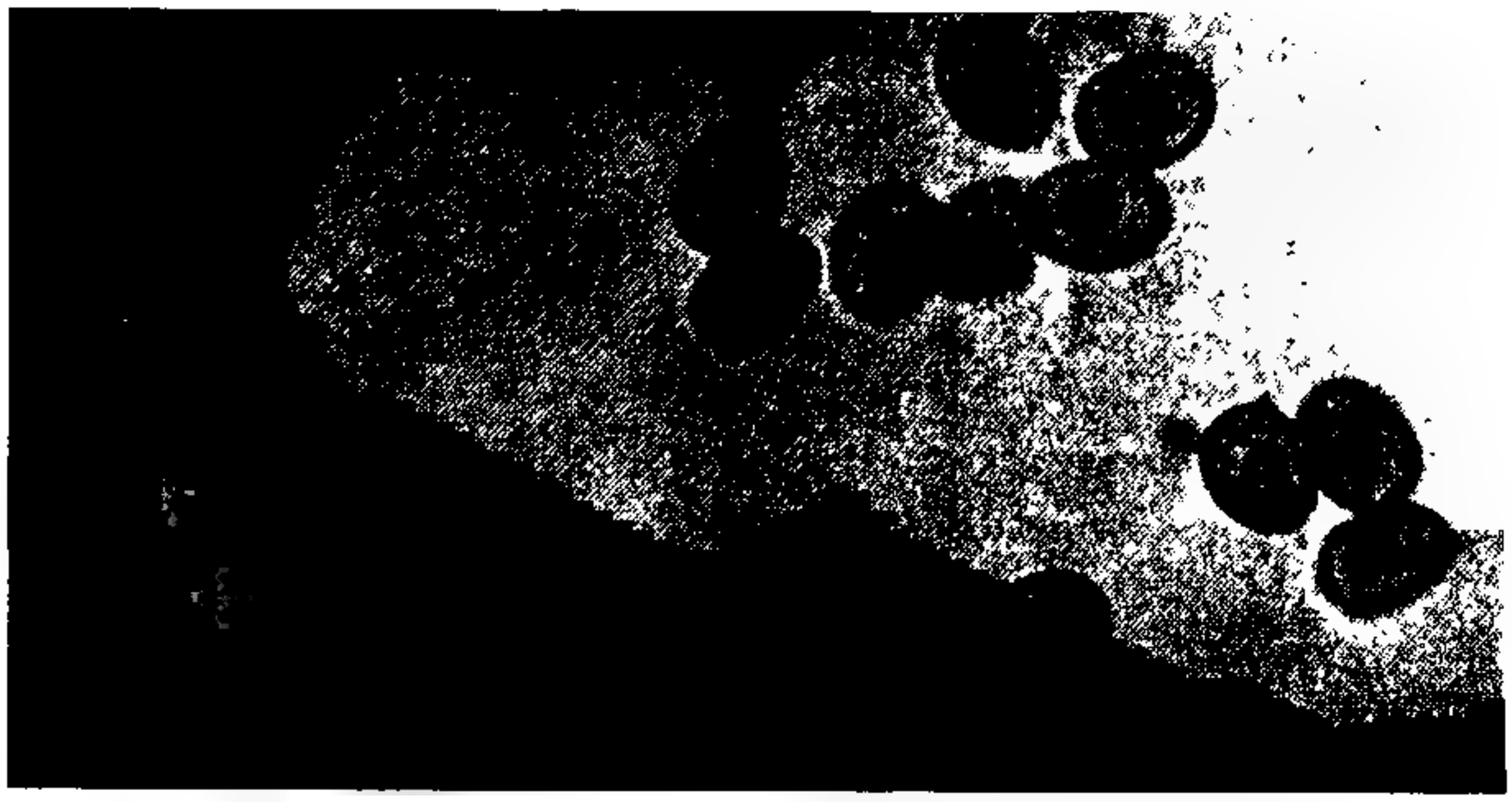
Mr. Rettew, who is Chemist for the Chester County Mushroom Laboratories in Pennsylvania, gives a description here of the scientific methods by which more than 20 million pounds of mushrooms are produced each year in a single area.—C. H. W.

ALTHOUGH the cultivation of mushrooms has been an extensive industry in France and England for several centuries, it was not until about 1918 that it was undertaken to any great extent in the United States. Since this time the industry has developed rapidly; today more than 40,000,000 pounds of mushrooms are produced in this country every year. Approximately 9,000,000 pounds go into the New York market alone.

Just south of Philadelphia, centering in Chester County, there is a concentrated area which produces more than 50 percent of the nation's supply, but there are smaller mushroom-producing areas near almost all large cities where the climatic conditions are suitable. The industry would expand even beyond its present output if the scientific care required in mushroom production were better understood by growers.

Although mushrooms are part of the plant world, the average horticulturist or agriculturist has little knowledge of the modern methods of their culture. And certainly the average housewife who buys a basketful or a can of mushrooms is ignorant of the source of this vegetable. It is the popular belief that mushrooms are generally raised in dark, damp, poorly ventilated caves. True, a small portion of the crop in this country is grown in caves, but only in those that can be kept dry and well aerated. Mushrooms do not develop well in high humidity or poor ventilation. Most of the commercial crop is therefore grown in specially built houses that are carefully adapted to meet their needs. Darkness is no more essential to them than it is to the mushrooms that grow in the woods and fields. Although, being fungi, they do not need sunlight, their development is not retarded by light so long as the hot rays of the sun do not fall directly on the beds.

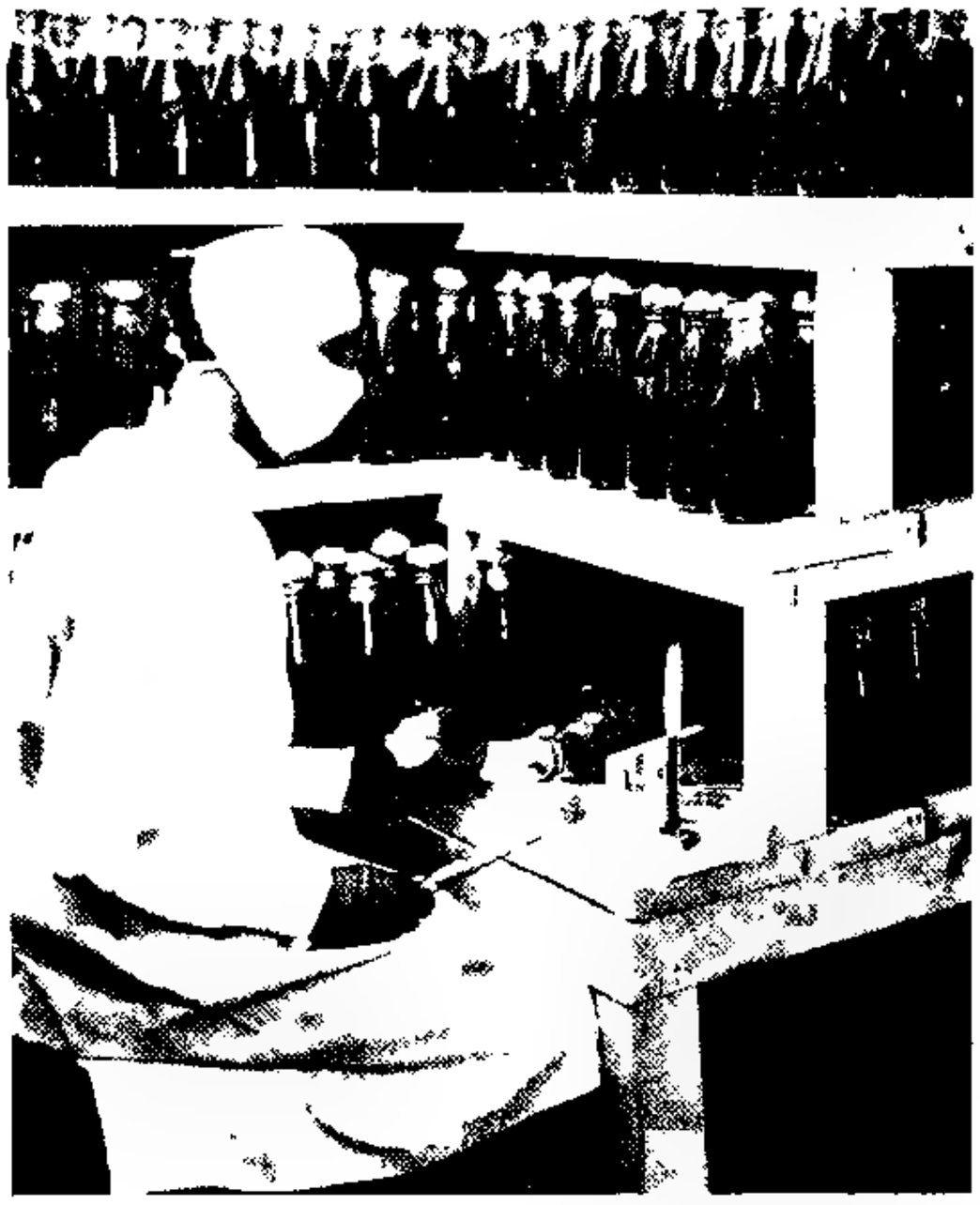
A relatively low temperature, however, is necessary. Thus without artificial cooling mushrooms can not be grown in the summer or in southern states. A few places are equipped with air-conditioning which makes production possible in the summer months and a few caves are satisfactory for summer growing, but most of the crops are grown in



Mushroom spores are shown here two or three thousand times enlarged. It is from these extremely minute one-celled particles of plant life that the cultivated mushroom —or any other kind—is developed.

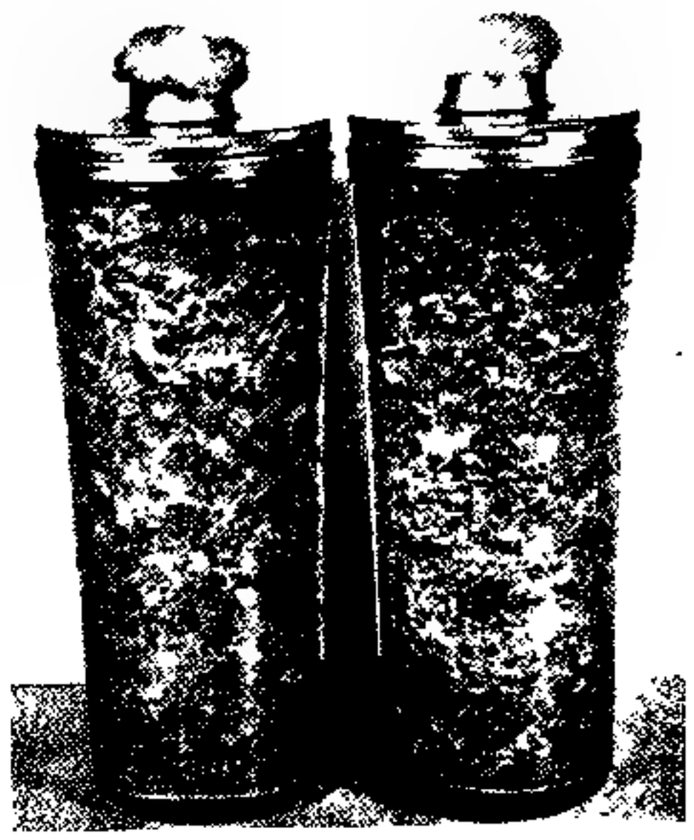
From spores like those at the top of the page, the mycelium of the mushroom develops. These tangled white threads, which are barely visible to the naked eye, comprise the "spawn" with which a culture medium is inoculated when mushrooms are to be produced commercially. A similar mycelium can sometimes be discerned in woodland soil in which mushrooms are growing.

All photographs are shown by courtesy of the Chester County Mushroom Laboratories.



Sterilized jars filled with a sterilized culture medium are inoculated with mushroom spawn grown under sterile conditions in a laboratory where their careful handling will prevent any infectious germs from entering.

Left: Inoculating culture jars with mushroom spawn. Below: Jars filled with tobacco-stems through and around which the mushroom spawn has grown.



the fall, winter, and spring. The canning of mushrooms in large quantities, however, makes them available the year around in any section of the United States.

Mushroom Spawn Produced Scientifically

Only one species of mushroom has been successfully cultivated in this country. This species is one of the Basidiomycetes, the two-spored variety of the common field mushroom, *Agaricus* (*Psalliota*) *campestris*. Different strains of this species have a pure white, cream, or dark brown cap on the mushroom. The white strain is generally used by the commercial grower.

A pure culture of the mycelium—the thread like vegetative portion of the plant—is used by the grower to plant in his beds of composted horse manure in order to produce the mushrooms. This mycelium, called mushroom spawn, is produced in special air-conditioned laboratories by trained technicians, starting with the microscopic spores of a pedigreed mushroom. These spores are produced on the club-shaped cells, called basidia, which are formed on the gills of the mushroom. The spores are taken from the mushroom under sterile conditions and are placed on a medium that contains satisfactory chemical and physical conditions for

their germination. The spore, which is an egg-shaped cell about one-five-thousandth of an inch in diameter, splits open and a colorless mass oozes out. This mass, which is surrounded by a thin cell-wall, then begins to elongate and to send out branches. Septa, or partitions, soon develop, dividing the elongated branching mass into individual cells. As these cells grow, developing end on end, branching and rebranching, the threads become very profuse, forming the mass of intertwining mycelium which is the mushroom spawn. Sterilized culture jars filled with a sterilized medium are inoculated under sterile conditions with this spawn. Formerly composted horse manure was used as a medium but an improved material has been developed which uses tobacco stems combined with humus and suitable chemicals.

After the culture is inoculated it is placed in large air-conditioned rooms where it is kept at uniform temperatures until the growing spawn has completely covered and grown into the medium. It is then removed from the culture jar and is either shipped to the grower at once or is slowly dried for future use. This drying puts the spawn in a dormant state without impairing the vigor of the culture. The fresh spawn is perishable and must be used within ten days of the time it leaves the laboratory, but the dried spawn will keep for several years without deterioration if it is not subjected to excessive humidity or extremes of temperature.

The spawn is planted by the grower in carefully composted horse manure. Mushrooms can be grown on artificial media but as yet none has been developed that is an economical or satisfactory substitute for horse manure.

Where Mushrooms Can Best Be Grown

Both commercial and amateur mushroom growing is done indoors in America, for climatic conditions here do not favor outdoor culture. The growing space must have the following requirements:

1. The room should be easy to ventilate thoroughly without producing chilling drafts. Mushroom production requires plenty of fresh air yet the beds cannot stand sudden changes in temperature.

2. Contrary to popular belief, the location where mushrooms are grown should not be too damp. Excessive humidity and excessive moisture are very harmful to the growth of the mushrooms.

3. Mushrooms will not develop satisfactorily above a temperature of 68°F., therefore the temperature should not go above this point during the production period. Mushrooms cannot be grown successfully in the summer months without artificial cooling, except in caves, and cave production is successful under only a very limited set of conditions.

4. Heating facilities must be provided so that the room can be kept at the proper temperature during the winter months. A hot water system is best as it produces less drying out of the beds.

5. The room must be so located that it can be completely closed up for fumigation and to accumulate sufficient heat during the sweating-out process to accomplish the final curing of the manure and the pasteurizing of the beds, all of which is necessary for successful production.

A bed of cured manure is here being planted with mushroom spawn which has been grown in a glass jar containing sterilized tobacco stems as a culture medium.

Many locations can be adapted to mushroom growing if the above conditions can be provided and if the location is convenient for spreading and removing the large quantities of soil and manure necessary. The specially constructed mushroom house has proved to be the most successful place for mushroom growing.

Methods in Growing Mushrooms

Fresh manure from horses bedded generously with wheat, rye, or barley straw is obtained from stables. It is placed in piles about six feet high and is turned at intervals of seven to ten days apart. As the manure is turned it is aerated as much as possible and the pile is turned inside out so that the outer layer that has been exposed to aerobic fermentation is turned in and the inside area placed on the outside where it will obtain the benefits of this process. The proper moisture is added to the compost as it is turned. It usually takes from three to five turnings to prepare the manure for the house.

The principal beneficial fermentation is brought about by aerobic actinomycetes plus some action by other fungi and bacteria. The most effective fermentation, therefore, occurs on the outer two or three feet of the compost pile. It is for this reason that turning is so necessary.

When the manure has become dark brown in color, has lost its fecal odor and shears readily when twisted in the hands, the beds are filled with

it to the depth of about six inches. The house is then closed and curing continues, the temperature rising in the beds to between 130° and 140° F. This process is called the "sweating-out" of the house and is very essential to make the final chemical and physical changes in the manure and to pasteurize the manure sufficiently to kill disease organisms and insects that would later harm the crop if this temperature were not reached.

After the sweating-out process is completed and the temperature has dropped to between 75° and 80° F., the beds are planted by lifting the manure to a depth of two inches at points from 8 to 10 inches apart in both directions and placing one or more pieces of spawn in each hole.

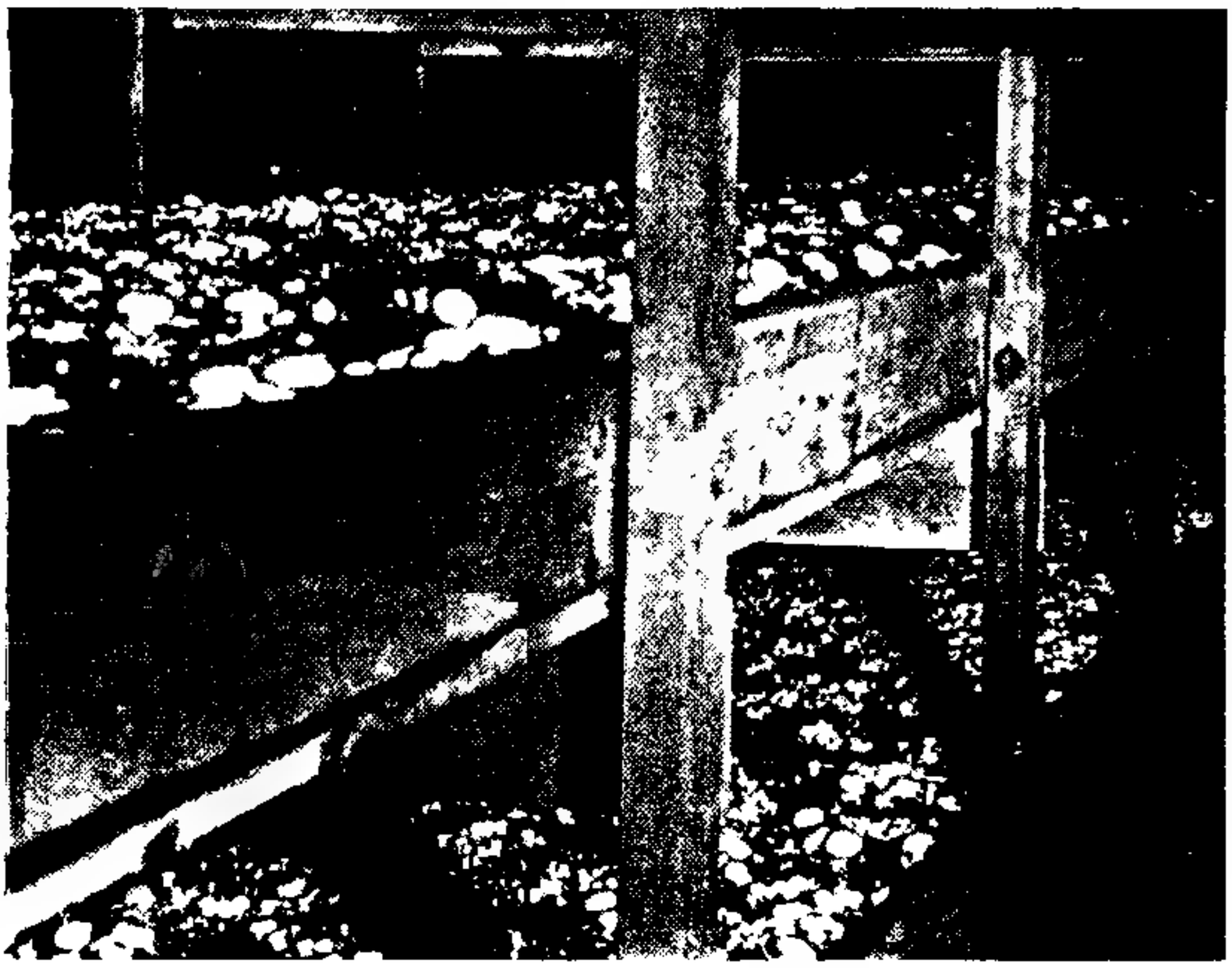
The spawn starts to grow at once, and until it has about met the piece next to it, the temperature is maintained at about 70° F.

The temperature is then dropped to below 62° F. and a layer of good, loamy, sweet, specially prepared soil, with a pH of about 7.50, is placed over the beds to the depth of about 1¼ inches. This process is called "casing" the beds and is usually done three to four weeks after planting the spawn.

In ten days to two weeks the temperature is again dropped to below 58° F. and the beds are watered lightly every other day until sufficient moisture is present to bring on the mushrooms. This requires from seven to ten days. Mushrooms develop in surges or "breaks." A mushroom is ready to harvest when the veil connecting the cap to the stem starts to stretch. It is picked by twisting, not pulling. After the good mushrooms

Three or four weeks after the mushroom spawn has been planted—that is, when it has grown so that adjacent pieces begin to touch each other -the beds are covered, or "cased," with a specially prepared loam placed 1¼ inches deep and tamped down smoothly and firmly.

of a break have been taken, the off-grade mushrooms and butts are cleaned from the beds. This process is called "trashing." The beds are then watered again for another break, and the process is continued until the beds are exhausted. The first breaks are the most vigorous, the quantity diminishing gradually on later breaks. A bed may be picked from three to seven months, the period depending on the temperature and moisture



About three weeks after the loam is laid on the beds the mushrooms begin to appear. The beginning of a good "break" of mushrooms is shown here.

conditions. A fast crop is obtained at higher temperatures and a slower crop at lower. The average production is about 1¾ pounds per square foot of space.

The mushroom is subject to a number of fungus and bacterial diseases and is also attacked by a number of insects. A grower must acquaint himself with these diseases and insects and constantly carry out control measures to prevent their development.

The purpose of this article is to outline conditions necessary for the cultivation of mushrooms. No attempt is made here to give complete instructions. For these, the United States Department of Agriculture Bulletin No. 1875 or the "Manual of Mushroom Culture" published by the Chester County Mushroom Laboratories should be consulted.

Ornamental Deciduous Shrubs

By P. J. van Melle

THIS is a continuation of the material first presented under this title in the Journal last month. It is intended as a brief review of hardy and useful kinds of shrubs recommended for use within a radius of 60 miles of New York City, and has been adapted from part of the series of lectures on "The Cultivation of Trees and Shrubs' in the TWO-YEAR COURSE IN PRACTICAL GARDENING *given at the New York Botanical Garden in the autumn of 1940.*

PEA FAMILY

Albizzia Julibrissin. This, the hardiest species in the genus, grows into a small tree farther south, but in the north it usually remains shrubby, to 7 ft. or more high. An interesting broad shrub with large bi-pinnate leaves and pink flowers in small round clusters. The var. *rosea*, with deep pink flowers is somewhat hardier than the type, and planted occasionally in sheltered situations mostly south of New York City and on Long Island. A highly decorative shrub.

Cytisus scoparius. Scotch Broom. Interesting, green-branched shrubs mostly not over 6 ft. high, with small trifoliate leaves and bearing bright yellow flowers in May or June. These are very effective on the almost bare branches. Though not reliably hardy north of N. Y. City, this broom has been to some extent naturalized along the southern New England coast, in sandy and gravelly soils, on barren slopes and roadside cuts. This naturalistic use is undoubtedly best, for the plant does not blend readily into the average domestic landscape. Numerous varieties of this species, some with partly red flowers, are in cultivation; most of them not as hardy as the type, and suitable for limited use only in the milder parts of our region.

Indigofera Kirilowi, from China and Korea, is an attractive small suckering shrub, with pinnate leaves and pretty, pink flowers in racemes to 4 in. long, in June. It deserves freer use in the foreground of the border. Not over 4 ft. high.

Amorpha canescens. Lead-plant. A low, native shrub to 3 ft. high or less, for the foreground of the border; with pinnate leaves and terminal clustered spikes of blue flowers in midsummer. For dry sunny places.

A. fruticosa, False Indigo, is a large and gawky native shrub growing to 10 ft. or more in height. Hardly suited for the average shrub border, it is better used in larger naturalistic plantings, preferably in moist and sunny situations. The showy terminal spikes of purple to brownish-purple flowers are effective even in the fruiting stage.

Robinia hispida. Rose Acacia. An attractive shrub to 7 ft. or more, forming large patches from suckering roots. Native from Virginia southward; hardy north and much used for park and roadside planting. Pretty enough for occasional use in borders, and thriving in any reasonably light soil, in full sun. Branches thickly beset with stiff, bristly hairs.

Colutea arborescens, the Bladder Senna, from Europe, is a robust, showy, broad shrub of rather erect habit, to 5 ft. high, bearing pinnate leaves and yellow-and-red flowers from June till August, followed by inflated green pods which are tinted reddish at the base. Decidedly useful in the border, the shrub thrives in light sandy soils in full sun. Var. *bullata* is dwarf.

Caragana arborescens, the Siberian Pea-Tree, is a very large spiny shrub or small tree, to 20 ft. high; much used in parts of this country as a barrier hedge, but too large and coarse a shrub for most small landscapes. It has pinnate leaves,

with yellow flowers in May. Var. *nana* is a dwarf form with twisted branches, of only moderate value.

Lespedeza Thunbergii (*Desmodium penduliflorum*). A shrub which freezes down to the ground every winter, in this region, then grows up in summer to a height of about 6 ft., producing on the new growth, in Sept. and Oct., an abundance of rosy-purple flowers. While these are very effective, the shrub itself tends to flop over and become rather too untidy for average border use. Sometimes staked and used in the background of large perennial borders.

CASHEW FAMILY

Cotinus Coggygria (*Rhus Cotinus*). European Smoke-Tree. A large shrub to 15 ft. high with rounded top and oval to obovate, somewhat bluish-green leaves; valued for the smoke like shroud of fruiting clusters covering the shrub for a long period in late summer; also for the yellow to purplish autumn tints of the foliage. An old-fashioned shrub, useful as an occasional specimen or in the background of a shrub border. It gets along in poor and stony ground. The American equivalent, *Cotinus americanus*, is less showy in fruit, but more brilliantly colored in autumn.

Rhus aromatica (*R. canadensis*). Fragrant Sumach. A useful native 3 to 8 ft. high, spreading from suckering roots The aromatic leaves, consisting of 3 leaflets, are green in summer and turn brilliant orange and scarlet in autumn. They are preceded in spring by rather showy spikes of yellowish flowers which mature as compact clusters of hairy red fruit. It is much used as a ground-cover in dry stony places, but because of the spreading roots it is hardly desirable for the foreground of the shrub border. It ranks high, nevertheless, for large naturalistic plantings.

HOLLY FAMILY

Ilex verticillata, Black Alder, is a very useful native deciduous holly to 10 ft. high, growing in swampy places, but adaptable to drier soils and borders, valued for the bright red berries lasting well into winter. Its foliage turns brownish after frost.

I. laevigata, Winterberry, to 6 ft., has orange-red berries and yellow autumn foliage.

Nemopanthus mucronatus, Mountain Holly, to 10 ft, with drooping red fruit and yellow autumn foliage, has similar value as a shrub for winter ornament.

STAFF-TREE FAMILY

EUONYMUS. Spindle-Tree or Spindle-Bush. An important genus containing many useful ornamental shrubs, native and exotic, serving varied purposes. Only a few of the more important deciduous kinds are here reviewed.

E. patens is a handsome, large- and glossy leaved shrub to 8 ft high with decumbent and rooting base. It retains its leaves throughout the winter only in entirely shaded places. Where exposed to winter sun, the leaves will shrivel by mid-winter and remain withered on the bush. A very valuable shrub for foundation plantings in northern exposures, where it blends well with many broad-leaved evergreens. About Sept. 1, the shrub is covered with a misty shroud of small greenish white flowers which are highly effective. In mild climates these are followed by showy fruits, but north of New York City the fruits seldom mature. One of the most valuable shrubby *Euonymus* species, especially since it is not subject to the scale insect which infests most species.

E. europaea. European Spindle-Tree. An upright shrub or small tree to 20 ft. high, with greenish twigs, valued mainly for its autumn display of ornamental fruit, which consists of a four-lobed, pinkish capsule, opening to display a bright orange kernel. A valuable large shrub, much subject to scale, for which it must be watched. The very small variety, *nana*, equally subject to scale, is sometimes used for clipped edgings.

E. alata, Winged Euonymus or Burning Bush, is a shrub of outstanding value, about 9 ft. high and fully as wide, serving in summer simply as a good green foliage shrub, enlivened toward autumn by tiny red fruits and very brilliant leaf colors which vary from a distinct Bougainvillea pink to the most brilliant scarlet. It makes impressive individual specimens or solid banks of foliage, serves

Here is one of the finest of all hardy flowering shrubs, yet it is seen only occasionally It is Xanthoceras sorbifolium, and it blooms while the leaves are still young, toward the end of May.

excellently in the shrub border, and makes also a fine clipped hedge. In winter, the bare shrub presents an unusual and beautiful pattern of winged branches, which are not the least of its charms. There is a variety *compacta* which grows to about 5 x 5 ft. but otherwise does not differ from the type. It, too, makes a fine clipped hedge.

E. americana, Strawberry Bush (do not confuse with *Calycanthus floridus,* also called by that name), has fruit of much the same color as that of *E. europaea,* but the lobes are covered with prickly warts. Grows to 8 ft. high.

E. yedoensis, from Japan and Korea, is a large coarse shrub to 15 ft. or more, valued for its showy fruit of about the same coloring as the preceding, but because of its coarse appearance not adapted to borders or compositions.

Celastrus scandens. Waxwork, or, more commonly, Bittersweet, is a native, rambling or twining shrub, valued for its red fruit breaking from orange capsules. It is a popular indoor winter decoration. A useful and attractive vine on fences in rural and naturalistic landscapes, and often used in the smaller, domestic landscape picture, to cover stumps. The fruit, much liked by pheasants, is borne in clusters at the ends of short branches.

C. orbiculatus (*C. articulatus*), the oriental species, is heavier-wooded and the fruit is produced in clusters all along the length of the branches.

SOAPBERRY FAMILY

Xanthoceras sorbifolium. This pretty Chinese plant is one of the finest of all flowering shrubs, and, though hardy throughout our region, it is too rarely seen. It thrives in any well drained soil, even in very dry and sun-scorched situations, and succeeds also in light shade. In the open, it will eventually form a broad, rather upright shrub to about 8 ft. high. In shade it will grow up taller and spindlier and may reach the proportions of a small tree. Young specimens are more loose and spreading. The pinnate leaves are glossy and bright green. As they develop, about Decoration Day, the plant puts up a rich show of short trusses of white to red-throated flowers, dainty and decorative, followed in summer by large green burs after the manner of horse chestnuts, containing large black seeds which are said to be palatable when roasted. This shrub deserves a place of honor in the border or on the lawn.

BUCKTHORN FAMILY

Rhamnus cathartica, the Common Buckthorn, is a useful shrub or small tree for very large borders or screens, thriving in open or shaded situations, and sometimes used for clipped hedges. In the open, a well developed specimen is most effective in autumn, topped with its spires of jet-black fruit, suggestive of but larger than that of the privets, and eaten by birds. The branches are somewhat spiny. Like the next, it is a European species, naturalized in North America.

R. Frangula is a somewhat smaller, thornless shrub, more often used for hedges.

MALLOW FAMILY

Hibiscus syriacus. Shrub Althea or Rose-of-Sharon. Popular, erect-growing shrubs to 10 ft. in height, of oval, sharply defined outline, rather emphatic in effect and not easily blended in shrub compositions. Often grown in so-called tree-form; that is, on short clear stems. They thrive readily on any reasonable, not too heavy soil and are hardy throughout our region. Valued for their large, showy, late summer flowers, which come both single and double, to 3 inches across, and in white and various shades of rose, violet and purple. The most desirable color-forms are the whites, occasional good pinks and near blues. Their best effect is perhaps as lawn specimens. They are, however, lacking in grace.

TEA FAMILY

Stewartia ovata (*S. pentagyna*) is a noble southerner, hardy well above New York City, but there best given a favored, sheltered situation. It forms a broad shrub, to about 15 ft. high and wide, though often smaller, and succeeds well in the light shade of other trees. It has large oval leaves which turn orange or red in autumn in open situations, and in July it bears large white, somewhat cup-shaped flowers of great beauty. In the typical form they have white filaments and yellow anthers, but in the variety *grandiflora*, the flowers, which are about 3 in. across, have purple filaments. The shrub prefers a comfortably moist, well-drained loamy soil.

Gordonia alatamaha. Franklinia. A very choice upright shrub, sometimes to 30 ft., but commonly much lower in cultivation; native of Georgia, thriving best in a moist, peaty and somewhat sandy soil. Not dependably hardy far inland above New York City, but it may succeed there occasionally in sheltered places. It is being grown successfully in boggy soil in New Jersey. The leaves, glossy green, turn scarlet in autumn, but the main value of the shrub is in the large white cup-shaped flowers, borne in September. Worth planting indeed, south of New York City and on Long Island, in suitable soils and situations.

ST. JOHNSWORT FAMILY

HYPERICUM. St. Johnswort. Most of the shrubby hypericums eligible for ornamental planting are not over 4 ft. high. Though valued mainly for their yellow flowers in mid- or late summer, they are hardly first rate subjects for the foreground of borders. Occasionally used are:

H. Kalmianum, H. prolificum, and ***H. frondosum*** (*H. aureum*), all natives. Other kinds of still lower and spreading growth are used as ground-covers, such as ***H. calycinum***, an Old World species with showy yellow flowers; not reliably hardy far inland.

TAMARISK FAMILY

TAMARIX. Most of the *Tamarix* species are too large and unwieldy and untidy for use in the average suburban border or landscape. They are distinctive shrubs with minute scale-like leaves which create an exotic, feathery effect. Minute rosy or lilac flowers are borne in showy terminal arrangements. None is quite reliably hardy inland north of New York City, but, even if the branches are partly frozen back they will flower in summer on newly produced growth. They succeed in dry, sandy, open situations and in salty and alkaline soils. As they even endure salt spray, they are suitable for seashore planting.

T. odessana, from the Caspian region, is the lowest and tidiest of the lot, growing only to about 6 ft. high, with attractive bluish-green foliage.

The Cornelian cherry is attractive in early spring with its tiny yellow flowers and again in August when it shows clusters of bright red fruits.

MEZEREUM FAMILY

Daphne Mezereum. An erect shrub to 3 ft. high, from Europe and western Asia, naturalized here and there in the eastern U. S. and hardy throughout our region. A neat little foreground shrub, valued for its early spring show of small lilac-rose flowers, literally covering the branches before the leaves appear. These are followed in late summer by scarlet berry-like fruit. Best in an open situation. Very much plagued in cultivation by scale, for which this shrub must be watched

OLEASTER FAMILY

Elaeagnus angustifolia. Russian Olive. A large shrub or small tree, to 20 ft. high, from Europe and Asia; planted mainly for the effect of the gray or dull-green leaves which have a silvery reverse side. The twigs also are silvery gray. Small, inconspicuous, fragrant flowers are borne in June, followed by sweet and mealy yellowish fruit coated with silvery scales and drooping from short pedicels. This shrub is too large for the average planting but is suitable as a lawn specimen or for very large borders.

E. commutata (*E. argentea*) the native Silverberry, is a smaller erect shrub to 12 ft., with leaves silvery-gray on both sides and short-stalked, dry and mealy fruit like that in the preceding. More useful for the background of shrub borders.

E. umbellata, from China and Japan, also to about 12 ft. high, has brownish twigs, silver gray leaves, and longer-stalked, juicy red fruit.

E. multiflora (*E. longipes*) comes from the same countries. Most commonly planted in borders, it is of spreading habit and grows to 6 ft. high, bearing sweet, juicy fruit in August.

All require favored situations in the colder part of our region.

GINSENG FAMILY

Acanthopanax Sieboldianus (*A. pentaphyllus*) is a useful, thorny, gray-twigged shrub of graceful habit, with spreading and sweeping, rooting branches, and good green foliage, the palmate leaves consisting of 5 to 7 leaflets. The whitish flower clusters are insignificant, but the plant is valuable because of its ability to withstand heavy shade under trees. It makes an impenetrable hedge.

DOGWOOD FAMILY

CORNUS. Dogwood. The Flowering Dogwoods, *C. florida* and *C. Kousa*, are not treated here, as they are considered as trees. Of several shrubby kinds hardy and useful in our climate, we note here only the following:

C. mas. Cornelian Cherry. A large broad shrub to 20 ft. high, effective in early spring with umbels of small yellow flowers and in August with conspicuous red fruit, pleasantly acid to the taste. An effective specimen shrub for open or shaded situations on large places; rather too large for average border use.

C. alba var. *sibirica,* from eastern Asia, is chiefly interesting in the winter landscape for its blood-red branches. The round cymes of small white flowers are hardly effective, but the white fruit is. There is a showy, conspicuous, variegated-leaf variety, *Spaethii.* To about 6 ft.

Cornus stolonifera, Red Osier Dogwood, is our native counterpart of *C. alba*, differing from it by its strongly suckering habit, but furnishing the same, though less brilliant, color value in the winter landscape It grows upward of 6 ft high, preferring moist soils. There is a dwarfer variety *flaviramea,* with equally bright yellow winter twigs, which may well be planted with the red-twig type for contrast. Both serve best in naturalistic plantings, particularly along water courses or in low land, where they associate well with willows, which the twigs resemble. (Osier is a name for willow.) Adaptable to drier situations, they sometimes take possession of waste lots.

WHITE ALDER FAMILY

Clethra alnifolia. Sweet Pepper-Bush. A valuable eastern U. S. native, planted mainly for its showy erect spires of white sweetly fragrant flowers in mid summer. A neat shrub, 4 to 6 ft. high in gardens, of erect habit, thriving best in moist, peaty and sandy soil, but adaptable to drier soil. It succeeds well in shade or in woodland conditions or in borders and is always welcome at a time when few other shrubs are in flower. Effective in bloom.

HEATH FAMILY

All members of this family require an acid soil.

ENKIANTHUS. Graceful, erect shrubs, to 15 ft. or more in height in cultivation, or remaining much lower, with mostly whorled branches, of a pleasing appearance in winter, presenting a structure suggestive of some tall erect azalea. Most commonly cultivated is:

E. campanulatus, from Japan. Its attractions are graceful, drooping clusters of more or less showy, small, yellow, bell-shaped flowers and foliage suggestive of azaleas, more or less brilliant red in autumn. In some plants the capsules, before opening, are somewhat attractive. Hardy, and succeeding in the open or in light shade; preferring moist soil, but accepting drier. A neat, pleasant shrub of unobtrusive though erect habit. Suitable for the background of borders of deciduous rhododendrons (azaleas). Associable with groves of birch, etc.

E. cernuus var. ***rubens,*** also from Japan, serves the same uses and has showy red flowers. Rather lower than *E. campanulatus.*

Zenobia pulverulenta, a native from North Carolina southward, growing to 6 ft. high or less, for our purposes amounts to a particularly attractive blueberry bush with glorified axillary flower clusters, usually in late May, and distinctly bluish-white foliage. Useful for borders, and associable with azaleas. Branches that have flowered should be cut back. Used along the Conn. and Mass. coasts, but not quite hardy inland.

VACCINIUM. Of the many species in this genus, most important for ornamental use are the blueberries and the deerberry. All those mentioned below are eastern U. S. natives, and their main use is in the naturalistic landscape.

V. corymbosum, the Highbush or Swamp Blueberry, growing from 6 to 12 ft. high, has scarlet foliage which rivals the most brilliant hues in the autumn landscape. It prefers moist or even boggy peaty soil.

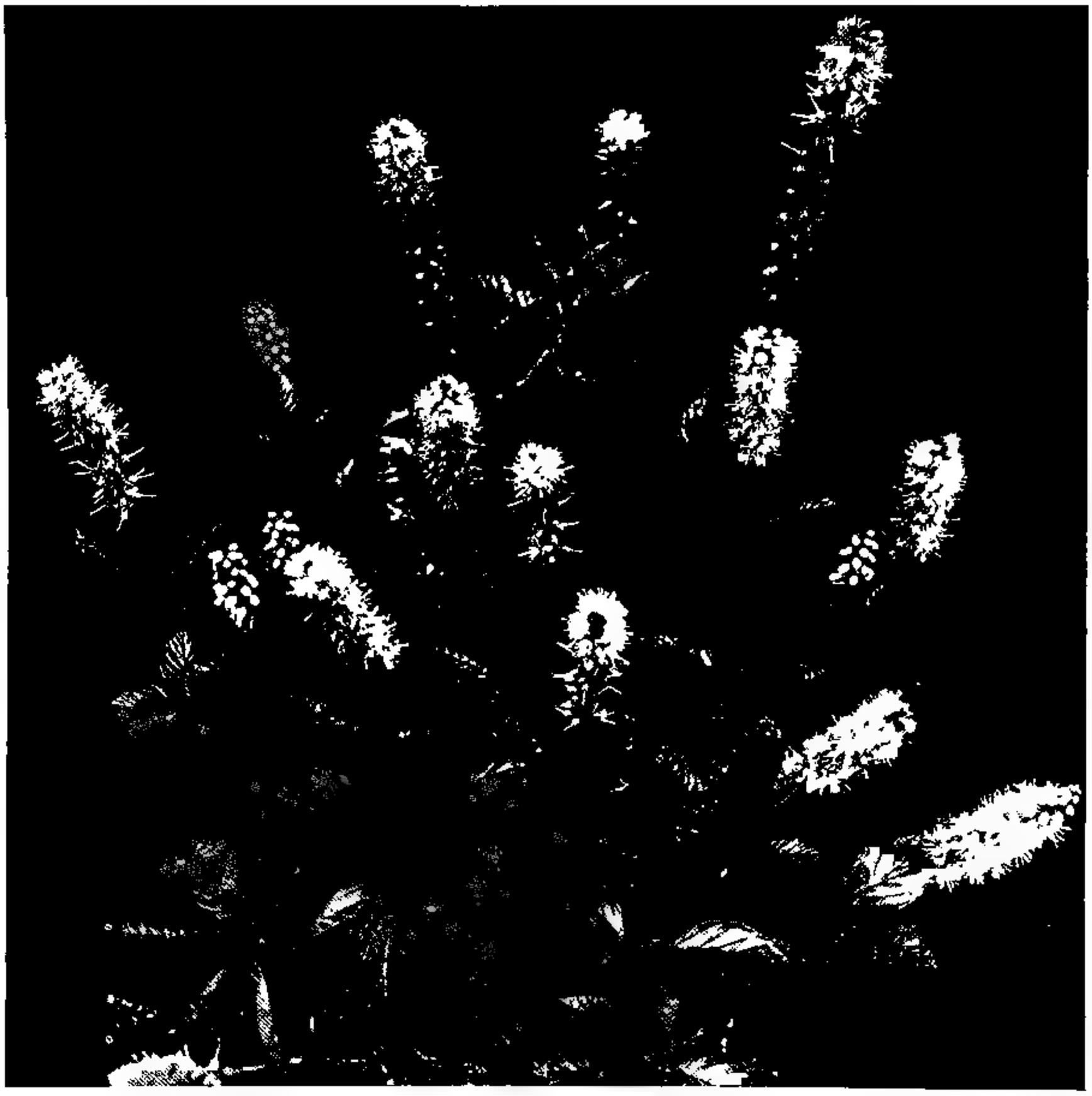
V. pensylvanicum, the Low Blueberry, which does not grow over 1½ ft. high, also colors brilliantly but the leaves are not retained so long. It endures a drier, sandier soil.

V. hirsutum, the Hairy Blueberry, to 2 ft. high, native to shaded woodland slopes, holds its foliage late and is therefore of value in the autumn landscape.

V. stamineum, the Deerberry, has attractive drooping clusters of flowers and graceful habit; useful in densely shaded woodland places. Fruits of this species are not palatable.

RHODODENDRON. We deal here only with the deciduous kinds, with which the popular name of Azalea is most commonly associated. Most of those here listed are best used in light shade or in places protected from sun at least during the hottest part of summer days—areas comparable to the natural fringes of woods or to light open woodlands. The azaleas lend themselves well for borders or light woodland plantings, and are an ideal material for use along woodland walks, associated perhaps with birches and dogwood. Their effect, though often brilliant, is never heavy In our selections, we may well give first thought to our eastern U. S. natives. It must be remembered that they demand a deep, cool, well drained, acid soil.

R. roseum, growing from 7 to 12 ft. high, has fragrant pink flowers, after some foliage has developed.



The sweet pepper-bush is a rather coarse but attractive native shrub which in late summer scents woodlands and gardens with its fragrant flowers.

R. nudiflorum, 6 to 9 ft., pink, without fragrance; flowers before leaves have developed.

R. calenduluceum. Flame A. 8 to 12 ft., with brilliant yellow to orange-red flowers.

R. arborescens, 10 to 15 ft., with fragrant white or pink-tinted flowers in June or July. Foliage colors brilliantly in autumn.

R. viscosum. Swamp A. 9 to 12 ft., with white, sometimes pinkish tinted, fragrant flowers, also in June or July, the foliage turning purplish in autumn. For rather open, dampish situations.

R. Vaseyi. Pinkshell A. To 12 ft., with very lovely, rose-pink flowers spotted with orange, appearing before the leaves.

The above are the hardiest of our native azaleas. Following are some of the best of the hardy exotic species:

R. Schlippenbachii. Royal A. From Manchuria, mostly less than 6 ft high in cultivation, with handsome large leaves, taking on brilliant orange red autumn colors. It bears large, pale-pink flowers, of fine quality but not as advantageously displayed as in many other kinds.

R. yedoense (*Azalea yodogawa*) is a low broad bush to 3 ft. high (or taller in shaded places), free flowering, and bearing double lilac flowers in May. A popular and very satisfactory foreground shrub. Var. *poukhanense*, sometimes semi-evergreen, has single flowers. The foliage often colors well in autumn in open places.

R. dahuricum and its variety *mucronulatum* are shrubs of upright growth, to 6 ft. high or less, bearing purple flowers the earliest of all in spring. The variety is deciduous, the typical form often semi evergreen.

R. mucronatum (do not confuse with *mucronulatum*, a variety of *dahuricum*), known also as *Azalea ledifolia*, is a low, spreading, semi-evergreen shrub, usually not over 4 ft. high, with handsome white flowers. One of the finest and most effective kinds, especially in large rock gardens or Japanese gardens, but not reliably hardy far inland. Var. *plenum* and var. *narcissiflorum* have double flowers. Especially large-flowered varieties have been catalogued under the heading of "Indica Magnifica" and "Superba" strains. Var. *roseum* has white flowers streaked with rose.

R. molle (*Azalea mollis*), from China, though offered by that name, is seldom available except in hybrid garden forms, which are mostly more satisfactory than the pure kind. They grow to variable heights, succeed well in open situations, and bear brilliant large flowers in yellow and orange shades.

R. luteum (*Azalea pontica*), from Asia Minor, to 6 ft. or more, has fragrant, yellow flowers.

R. japonicum grows to about the same height, but is more erect, and bears flowers in deeper shades of orange- to brick-red, before leaves appear.

Brilliant-flowered hybrids of several of the above species are available. Among them are the Ghent Hybrids, derived from *R. luteum* and our native species, *R. calenduluceum* and *R. nudiflorum*. These are hardy and very colorful, deserving free use in the home landscape.

The so-called Kosteriana Hybrids, to which belongs the clear yellow-flowered clone, Louise Hunnewell, are derived from *R. molle* and *R. japonicum*.

The deciduous rhododendrons are subject to the same insect troubles that plague the evergreen kinds. One of the most troublesome is the lacebug, of which two broods occur, one in late May and one in July. They feed on the lower leaf surfaces, covering them with a rusty deposit, and call for prompt spraying with nicotine and soap.

(To be continued)

William S. Thomas

THE Botanical Garden lost a staunch friend of many years' standing in the death on Dec. 21 of Dr. William Sturgis Thomas of New York City, physician and amateur botanist, prominent in the field of mycology. He had been a member of the New York Botanical Garden since 1927 and a member of the Corporation for the past 11 years. All this time he worked actively in the interests of the Garden, making many other persons acquainted with its work and its

displays, and lecturing frequently on the Saturday afternoon programs.

During the Spanish-American and the first World Wars, he served at sea as a Navy medical officer. Only shortly before his death, upon America's entry into the second World War, he had completed arrangements to instruct civilians in first aid, volunteering for the Red Cross.

As a physician, Dr. Thomas had a broad range of experience in surgery and general medicine but since the 1920's he had specialized in allergy. He was nationally recognized for his contributions to the relief of hay-fever and asthma sufferers. At St. Luke's Hospital he established the Allergy Clinic, one of the first in the country, in 1921, and served as head of the Department of Immunology there until his retirement in 1940. His ever-active mind led him recently to a study of vitamins and their effect on the human system, and his interest in this subject is evidenced by a 16-page pamphlet entitled "Vitamin Data" which he compiled and distributed late in 1941.

Besides a "Textbook on Asthma" and several other volumes, Dr. Thomas was the author of the "Field Book of Common Gilled Mushrooms" published by Putnam in 1928, a second edition, enlarged to 369 pages, appearing in 1936 under the title, "Field Book of Common Mushrooms." Illustrations for the colored plates in the book were made by Miss Mary E. Eaton while she was a member of the staff at the Botanical Garden. This volume has sold widely and has served to acquaint many laymen with a little known field of botany.

The medical, musical, military, historical, and scientific organizations with which Dr. Thomas was associated were many. He helped found the New York Mycological Society and for years served as its President. He also had been a member of the Council and Vice-president of the Torrey Botanical Club. He contributed to the Journal of the American Medical Association, the Journal of Allergy, and the Journal of the New York Botanical Garden, for which he wrote a comprehensive article on the beefsteak mushroom that appeared in September 1937.

A man of great ability as an interpreter of nature and as a teacher, Dr. Thomas was the leader of many excursions for the Torrey Botanical Club and the Mycological Society, as well as countless informal groups. He continued his active interests in these and other fields, including his private practice, until two days before his death, which came as a result of a heart attack. He was 70 years old.

Besides Mrs. Thomas and a sister, he is survived by a daughter, Mrs. A. T. Jersild, and a son, William Stephen Thomas, who is associated with the American Philosophical Society in Philadelphia.

Howard Eric

Succumbing to a long illness, Mr. Howard Eric of Stamford, Conn., died Nov 28. As a member of the New York Botanical Garden, Mr. Eric had been one of the institution's greatest individual benefactors during the past few years, for he contributed many rare and exotic plants which were brought into bloom and displayed in the conservatories.

Among his acquisitions for the Garden were the bulbs of the blue amaryllis which were featured in the Tropical Flower Garden a year ago, a large number of unusual orchids, many Hippeastrum hybrids, and many hundreds of other bulbous subjects, a total of 1,900 plants during the past year alone. Besides these greenhouse subjects, he contributed 100 specimens of mountain laurel for the Garden's outdoor plantings. Additional plants of the blue amaryllis (*Hippeastrum proecrum*) which he obtained from Brazil since the first ones bloomed, have been flowering in the Main Conservatories this winter.

Mr. Eric's keen interest in plants brought him to the Botanical Garden two years ago to work for a while among the gardeners. On his estate, called Riverbank Farm, at Stamford, he had a splendid collection of plants, outdoors and in the greenhouse, all of them noteworthy for the fine cultivation they exhibited.

A member of the Grolier Club, Mr. Eric also was a connoisseur of rare books and maintained a remarkable library.

Late in 1940 he went to Florida to serve as a judge at the annual show of the American Amaryllis Society, taking T. H. Everett with him as a fellow-judge. During the trip he was taken ill, and never completely recovered.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

The Student Will Be Fortunate

TEXTBOOK OF BOTANY. E. N. Transeau H C Sampson, L H T.f-fany. 812 pages, illustrated (424 figures, 4 plates in color), indexed. Harper & Brothers, New York 1940. $4

Here is an extremely interesting and readable presentation and integration of the field of botany without the unnecessary dismemberment of the field into its several component "sciences." The authors state, "Our aim has been to help the students organize that background [of basic information, scientific inferences and points of view about the plant part of our environment] and appreciate some of the numerous inter-relations of plants and animals, particularly man." This reviewer believes that this aim has been adequately and happily realized

Although not every instructor might agree with the arrangement of and the sequence of the chapters, the organization of the volume is completely logical. Especially to be commended are the chapters entitled "Seasonal Aspects of Plants," "Flowers, Fruits and Seeds," "Plants of the Past" and "The Vegetation of North America." The photographs, drawings and colored plates with which this text is illustrated are excellent, and the lists of references at the end of almost all the chapters are exceedingly valuable. Fortunate indeed will be the student whose introduction to botany is attained by means of this book.

CHARLES GILLY.

The Wishing Book

PLANTS IN THE HOME. Frank K. Balthis. 172 pages, illustrated, indexed Macmillan, New York. 1941. $2.50.

In one of our far-away northwestern air-bases, a long distance from large stores and abundance of shopping choice, the catalogue of a well-known mail-order house is known by a rather delightful name—the "Wishing Book."

While reading Mr. Balthis' good and valuable work and especially when looking at the delicate illustrations, this name kept recurring. How happy most of us would be if our house plants looked in the least like those glorious products of perfect horticultural practice, bursting with bloom and with such splendid growth of stem and leaf! Naturally, the author is holding up an ideal, but it is just a scrap depressing to the common or garden variety of home window-gardener. Also the plants in the illustrations should have been named.

Be that as it may, it is a good book, a fine and useful one which will help with many suggestions. It would have improved it to divide the text into a greater number of titled sections. It goes on page after page rather too glibly for the lumbering mind of the amateur.

Two statements puzzle a little. Probably Mr. Balthis is correct, but the ideas are new to this writer: first, that "the light from the east never equals in intensity that from the south or west." Western light had always been supposed to be weaker in intensity than eastern. The actinic quality of eastern light is surely greater? The other statement is that "buds will develop in the dark better than in the light."

It would be helpful if someone would be good enough to comment on these two statements.

SARAH V. COOMBS.

An Explorer's Many Trails In South America

PLANT HUNTERS IN THE ANDES. T. Harper Goodspeed. 421 pages, illustrated, indexed Farrar & Rinehart, New York, 1941. $5

Professor Goodspeed, in this new book, gives an account of innumerable "humming-bird" calls over an amazing amount of territory in Ecuador, Bolivia, Chile, Paraguay and Argentina—on a search for South American species of *Nicotiana*.

Besides *Nicotiana* for study, he brought back a number of plants that will undoubtedly be of interest to gardeners.

Through the journeyings of twelve members on two expeditions—one in 1935-36 and the other in 1938-39—the author, as a weathered plant hunter, reveals the many difficulties of collecting. To arrive in a given territory at just the right time for collecting seeds and flowers, to cope with the problem of living, getting specimens dried under conditions which are often adverse, and the necessity of shipping collected spoil back to the home base immediately, are paramount among these difficulties. But what a thrill in finding a long-sought plant!

Here and there throughout the text are very personal and colorful descriptions of the Andean country, its picturesque natives, and their habits of life. Nights spent with the Indians, featuring sleep in company with guinea pigs or chickens—not to mention lesser inhabitants that crawl about in the darkness, rather check the urge to follow in Professor Goodspeed's footsteps. The book, however, is excellent reading, and its illustrations are superb.

HOWARD W. SWIFT.

Introduction to Taxonomy

FLOWERS AND FLOWERING PLANTS. Raymond J. Pool. 428 pages, indexed and illustrated. McGraw Hill, New York. Second edition, 1941. $3.50.

The first edition of this book, which appeared in 1929, has long been of value to teachers and to students. It was designed to introduce students to the methods and concepts of the taxonomy of flowering plants. A series of chapters discusses the structure of flowers, the production of fruit and seed and the types of these parts, the dispersal of plants, the morphological criteria of relationships among the families of flowering plants with an exposition of the Besseyan system of floral diagrams, and the history and principles of the classification of flowering plants. The greater part of the work is given to concise and well-illustrated descriptions of a wide selection of families.

In the new edition, a chapter has been added on the vegetative parts, with an introduction to the taxonomic jargon necessary to designate the various shapes, surfaces, margins, etc., of leaves. Two historical chapters have been moved to the end (but still contain a reference to "the following chapter" which no longer follows). The large folded chart of relationships has been simplified by the omission of all family names, and embellished with small pictures: a symptom of our educational trends.

A brief glossary which has been added should be useful. A number of small errors have been corrected; a few remain, such as "axes" for "axils" on p. 105. One could wish that the revision had affected the very inaccurate treatment of inflorescences in Chapter VIII. But such defects are minor; we are glad to see the work continue its useful career.

H. W. RICKETT.

Twelve Mentors for the Gardener

GARDENING WITH THE EXPERTS. 239 pages, illustrated by Hiram Hurd. Macmillan Co., New York, 1941. $2.50.

"Gardening With the Experts" is a presentation of various phases of the art of gardening by a number of acknowledged authorities. Beginning with a short history of gardening by Richardson Wright, the book embraces such topics as herbaceous plants, including herbs, also roses, lawns, shrubs, house plants, garden sanitation and many more. The other contributing authors are: Henry E. Downer, Robert L. Lemmon, Rosetta E. Clarkson, J. Horace McFarland, Montague Free, Dorothy Biddle, Dorothea Blom, Cynthia Westcott, Howard B. Sprague, Donald Wyman and Sarah V. Coombs.

There is a certain flavor of continuity about it that one hardly expects from a work of this kind. At each phase the reader is met with a fresh viewpoint presented in a different style. The subjects are not lengthy, extraneous matter being excluded. The articles are reduced to bare essentials and these are presented in a brisk but enthusiastic fashion.

To amateurs and to those making their first introduction to gardening, the book will be stimulating and at the same time furnish valuable guidance.

P. J. MCKENNA.

Current Literature At a Glance*

Sycamore Bug. Injury to sycamore leaves in eastern states has been found to be due to a small plant bug. The symptoms, the bug itself, and methods of control are described in *Arborists' News* for November.

Gourds. An informative booklet on gourds—their uses, culture, and identification, with abundant illustrations—has been issued by the Agricultural Experiment Station of the University of Minnesota as Bulletin 356.

Parks. A new edition of the National Park Service's booklet, "Glimpses of Our National Parks," has been revised by Isabelle F. Story from the original which was issued more than twenty-five years ago. It gives picturesque descriptions with illustrations and maps of more than thirty National Parks.

Bacteria. The story of bacteria is told effectively, with diagrams and drawings, by M. W. Jennison in the March-June number of *The New England Naturalist*, published by the Boston Society of Natural History.

Science Fund. The history of the National Science Fund, of which Dr. W. J. Robbins is chairman, is told by Dr. Albert F. Blakeslee in *Science* for Oct. 17. Dr. Blakeslee outlines the organization's three ideals of service to donors, to scientists, and to humanity.

Virginia Plants. The October and November numbers of *Rhodora*, Journal of the New England Botanical Club, each contain another century of additions to the "Flora of Virginia" by M. L. Fernald.

Lichens. More than a score of photographs of lichens appear in the picture section of *Nature Magazine* for November.

Fertilizers. Good vegetables may result from following directions in a leaflet recently issued by the College of Agriculture at Cornell. "Approved Fertilizers for New York" is the title of the leaflet, which lists the kinds needed for different crops on different types of soils.

* All publications mentioned here—and many others—may be found in the Library of The Botanical Garden, in the Museum Building.

Notes, News, and Comment

Retired. On January 1 Dr. J. H. Barnhart became Bibliographer Emeritus of the New York Botanical Garden. He had been Bibliographer since January 1913, and had been a member of the staff for exactly ten years previously. A brief account of Dr. Barnhart's career will appear in a forthcoming number of the Journal.

Art Exhibits. Three artists are showing their work at the Botanical Garden this winter. From Dec. 15 to Jan. 15 there was a collection of flower paintings by Mercedes de Córdoba; following that and continuing through Feb. 17, Edith Farrington Johnston is displaying about two dozen of her paintings of wayside fruits that attract the birds, to be used in a forthcoming book by Margaret McKenny. Flowers in Costa Rica will be shown from Feb. 21 to Mar. 21 by Laura F. Lyon, who has recently returned from there.

Bougainvillea. Two specimens of a rare white bougainvillea were brought from South America by Mr. B. A. Krukoff late in the year as a gift from the Trinidad to the New York Botanical Garden. The plant was discovered in the West Indies a few years ago, and was successfully raised from cuttings at the Trinidad Botanical Garden. With the exception of one living plant in Miami, no record seems to be available as to its being in cultivation in the United States.

Advisory Council. Mrs. Robert H. Fife showed slides and lectured on South America at the meeting of the Advisory Council on Dec 3 at the home of Mrs. William Felton Barrett in New York City.

Movie. The Garden's motion picture was shown the evening of Dec. 4 to members of the class in "Fundamentals of Gardening" and also to a group of journalists, members of Theta Sigma Phi, who were meeting at the Garden that evening. Elizabeth C. Hall arranged an exhibit in the library showing periodicals from the late 18th century and books from the late 16th in the fields of botany and horticulture. A brief talk on publicity projects and problems at a public institution was given to the

journalists by Carol H. Woodward. The movie was shown Nov. 14 by Dr. A. B. Stout before 1500 students of the "Honor School" during open-school week at Evander Childs High School in the Bronx.

Phi Beta Kappa. In celebration of the 165th anniversary of the founding of the Phi Beta Kappa Society, Dr. William J. Robbins gave the principal address at the University of West Virginia, Dec. 5.

Conference. The Flora of Kashmir, India, was the subject of Dr. R. R. Stewart, who is the head of the Gordon College in Rawalpindi, India, at the conference of the scientific staff and registered students of the New York Botanical Garden Dec. 10. Following this talk, Dr. E. H. Fulling showed kodachrome views of Williamsburg and Charleston gardens.

Orchid Biography. During December, an exhibit of orchids from seed to flower in a section of the Tropical Flower Garden in the Main Conservatories attracted many students and other visitors. Among the seeds and seedlings shown in test tubes were some that had been provided by Dr. Lewis Knudson of Cornell University, who is the first person ever to have succeeded in germinating vanilla seeds. Orchids in all stages of growth, even to a plant with a ripened seed capsule, were shown near the exhibit of orchids in full bloom.

School Children's Outing. A trip to New York City from Middletown, N. Y., with the Botanical Garden and the Zoo as the chief destinations, was the event of the year for a group of children, teachers, and parents, who spent the afternoon of Dec. 6 at the Garden. The fifty children were pupils at the Pilgrim Grammar School in Middletown, and they were accompanied by their principal, Mr. Russell Gowdey, two teachers, and eleven parents. To raise money for the trip, the children sold newspapers, also chances on a live chicken, which one of the parents had contributed, their mothers had a cake sale and card party, and photographs of the school were sold at ten cents each. Two busses brought the crowd to the Garden, where they visited the Main Conservatories and the first floor and basement of the Museum, under the guidance of Mr. P. F. Connnolly, Mr. and Mrs. P. J. McKenna, and Miss Elizabeth C. Hall. Dr. Robbins spoke briefly to the group in the Museum Building, and Mr. McKenna presented each of the children and adults with a small succulent plant in a pot.

Torrey Club. Members of the Torrey Botanical Club, meeting in the Members' Room of the Garden Dec. 17, heard Dr. W. J. Robbins speak on "Vitamins and the Growth of Plants." Dr. Robbins showed test tubes containing species of *Ceratostomella,* which responded in different manners to different vitamins in the culture medium, among them, the test tubes illustrated with his article in the November Journal. Sixty-seven attended and tea was served afterward.

College Groups. Among the classes which have been brought to the Garden in recent weeks are two sections from the Art Department of Hunter College under Mrs. P. J. McKenna, and a class in botany from Fordham University under Dr. W. J. Bonisteel. The Hunter College groups studied a library exhibit of books and herbals showing the history of botanical and horticultural illustration, and Elizabeth C Hall gave a talk on the various types of illustration. Dr. J. H. Barnhart and Miss Hall both spoke on the history of the library and its collections for the Fordham students.

Defense Gardening. Dr. W. J. Robbins went to Washington Dec. 19 to attend the conference on defense gardening called by the United States Department of Agriculture.

Traveler. Mr. B. A. Krukoff returned late in November from a trip to Central and South America, during which he spent ten days in Guatemala examing the cinchona plantations of Merck & Company, and visited Trinidad, British Guiana, and Surinam, largely in connection with work for the Chicle Development Company on a substitute for chicle.

Loan Exhibit. Two of the Garden's paintings of Australian flowers, which were presented last year by the Australian government, were lent to the Metropolitan Museum of Art for a month during November and December to accompany a special exhibit there, showing the art of Australia.

Book Fair. The Banckes Herbal, the Garden's Tapestry booklet, and the

Journal were entered as exhibits in the Natural History Book Fair at the American Museum of Natural History, Nov. 26 to 31.

New Position. Howard Swift, who has been employed on the gardening staff since 1934, is leaving the Garden the middle of January to accept a position with the W. Atlee Burpee Company in Philadelphia. Mr. Swift was the first exchange student gardener to be sent to the Royal Botanic Gardens at Kew in England in 1936.

Spring Flowers. An unexpected flower show was held in December at the Garden. The mild weather which persisted into the middle of the month brought many spring and summer flowers into bloom outdoors; and the Garden displayed about twenty different species in vases and jars on the stair landing in the Museum Building. On the afternoon of Dec. 11, a boxful of the flowers was taken to LaGuardia field at the request of the United Air Lines for shipment to California for display in the office of the company there. Among the plants that were in bloom were flowering cherries, buttercups, bluebells, arabis, yellow flax, primulas, phlox, pinks, heather, pansies, Johnny jump-ups, sweet alyssum, and thrift. Some foliage of other plants, including columbines, was used in the bouquets

Lectures. Recent lectures given by members of the staff include "If I Had a Small Garden" before the Garden Department of the Community Club at Garden City, Long Island, Nov. 10, "Begonias and Their Culture" before the Mamaroneck Garden Club, Nov. 24, and the same subject before the Men's Garden Club in New York City, Dec. 4, by T. H. Everett, and "Treasurers of the Watchung Hills" before the East Orange Garden Club, Nov. 10, by Dr. H. N. Moldenke.

Volunteers. Lawrence Hadland and John Engett, student gardeners, left the Botanical Garden the last of December to volunteer for service with the United States Army.

A.A.A.S. The New York Botanical Garden was represented by five members of the staff at the annual meeting of the American Association for the Advancement of Science at Dallas, Texas, the week after Christmas. Dr. W. H. Camp gave an invitation paper before Section G (Botany) on "The Individual in Relation to Complex Species in *Vaccinium.*" He also spoke before the Systematic Section on "Biosystematy and the Concept of the Species," a discussion of the kinds of species, of which Charles Gilly of the New York Botanical Garden was co-author. Dr. H. W. Rickett also addressed the Systematic Section on "Distribution of Some Species of *Cornus.*" Dr. B. O. Dodge, Dr. J. H. Barnhart, and Dr. F. J. Seaver also attended the meetings, Dr. Dodge speaking before the Plant Pathology Section and Dr. Seaver giving his annual reports as editor and managing editor of *Mycologia.* Another Garden representative there was Dr. Roberta Ma.

Staten Island. Dr. William J. Robbins represented the New York Botanical Garden at the sixtieth anniversary celebration of the Staten Island Institute of Arts and Sciences the evening of Nov. 12. Among the founders of the Institute in 1881, then known as the Natural Science Association of Staten Island, were Dr. N. L. Britton and Dr. Arthur Hollick, both of whom figured prominently in the early history of the New York Botanical Garden, which was begun about ten years later. Today, Joseph F. Burke is a trustee of the institute and an active worker there, as well as an honorary curator at the Botanical Garden.

All-America Selections. Among the 47 new varieties of garden flowers tested at the New York Botanical Garden last summer for the All-America Selections, a white morning glory named ***Pearly Gates,*** a spider-plant (*Cleome*) named ***Pink Queen***, and a cosmos named ***Yellow Flare*** were awarded silver medals. Bronze medals were awarded to three new marigolds called ***Butterball, Melody*** and ***Golden Bedder***, and to ***Purple Robe*** nierembergia. Honorable mention went to a phlox named ***Red Glory,*** a petunia called ***Glamour,*** a zinnia named ***Royal Purple,*** and a rudbeckia called ***Starlight.*** The choice of the winners was made on the basis of tests conducted at 12 different places in the United States. Seeds of these new varieties will be available in the trade for 1942 gardens

THE NEW YORK BOTANICAL GARDEN

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ETHEL ANSON S. PECKHAM	*Honorary Curator, Iris and Narcissus Collections*
ARTHUR J. CORBETT	*Superintendent of Buildings and Grounds*
A. C. PFANDER	*Assistant Superintendent*

To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy

Pkwy., or, coming from Westchester, turn

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MEMBERSHIP IN THE GARDEN

Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests. Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public.

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia once a year, each number illustrated with eight colored plates of unusual plants, accompanied by descriptions.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

(4) Announcements of special floral displays, programs, lectures, and other events at the Garden.

(5) Credit to the amount of the membership fee paid, toward courses of study offered by the Garden.

(6) The privilege of borrowing lantern slides from the Garden's collection.

(7) Use of the Members' Room in the Museum Building.

A limited number of garden clubs are accepted as Affiliates. The privileges of affiliation are one lecture a year by a member of the staff, a share in the distribution of plants when they are available, a subscription to the Journal and to Addisonia, and announcements of special activities at the Botanical Garden. In addition, any member of an affiliated club may receive for the current year of membership a reduction of $5 in the fees paid for instruction. (This does not apply to the course for professional gardeners.) An Affiliate Garden Club may borrow lantern slides from the Garden's extensive collection, such loan being subject to the regulations for the use of lantern slides by individual members. Likewise, an affiliate club may engage without fee the Members' Room at the Garden for its meetings.

The classes of membership are as follows:

Annual Member	annual fee	$ 10
Sustaining Member	annual fee	25
Garden Club Affiliation	annual fee for club	25
Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
Patron	single contribution	5,000
Benefactor	single contribution	25,000

Fellowships or scholarships for practical student-training in horticulture or for botanical research may be established by bequest or other benefaction either in perpetuity or for a definite period.

Contributions to the Garden may be deducted from taxable incomes. The following is a legally approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————————.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York, N. Y.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

FLOWERS FOR OTHERS

WHEN members of the Botanical Garden come to visit the Main Conservatories or, in warmer weather, to enjoy the outdoor plantings, they are by no means seeing all of the displays toward which they are contributing with every payment of their annual dues

There are children in New York schools who would never see a flower unless a plant were brought into the classrooms; there are high school students who need suitable plant material for their classes in science and in art Also there are shut-ins in many institutions where funds must go, perhaps, for medical care with none left over for the flowers that would bring much needed cheer; and there are other institutions—charitable and educational—the services of which are greatly enhanced by the presence of flowering and foliage plants.

To such institutions—schools, hospitals, penitentiaries, community centers, and others the New York Botanical Garden during 1941 contributed more than 20,000 plants When there were specimens to spare, the Garden also gave plants to individuals—sometimes to needy persons, sometimes to those who expressed an interest in the study or culture of particular plant groups.

Perhaps the gratitude of all the recipients is expressed in one or another of the heartfelt letters received from individuals. Wrote one lonely woman: "You see, I am old and sick, and . new kinds of plants help me to forget." And a man of 84 expressed his gratitude by saying, upon receipt of the Garden's gift in the autumn: "Spring is here! I shall give the plant all the care and sunshine it needs, and on my summer visits to Bronx Park I will try and see you and convey my personal thanks."

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Getting An Early Start With Vegetables

By James G. Esson

GARDENERS can lengthen the season of vegetables that they grow by starting certain kinds early—some as early as February.

There are various methods by which this can be done. The greenhouse is, of course, the ideal place, but the kind of structure is not important provided there is good light. If the right spot is available, seeds of cabbage **(Early Jersey Wakefield)**, cauliflower **(Early Snowball)**, broccoli **(Italian Market)**, and lettuce **(May King)** may be sown any time during the second half of February to produce plants for setting out in the garden during April or as soon as it is reasonably certain that there will be no more night frosts.

There are, of course, other varieties of these vegetables mentioned that one may use for early planting. It is important, however, that we choose those recommended by our seedsman as being early.

The smallest sized packet of seeds of any of these vegetables offered by a reliable seed house should suffice for the average home owner. For germination, any kind of container may be used, providing of course, that good drainage is assured. A temperature of from 50° to 55° F. must be maintained. Use a sandy loam in the containers, sow the seeds thinly, and cover them very lightly.

This last must be strongly stressed. Much good seed is wasted by too heavy a covering of soil, thus burying and not sowing at all. Indeed, seeds will germinate without any covering provided they are kept steadily moist; but, if scattered on a nice firm level surface with just enough soil over and around them to make them stay put, it will be easier for their tiny roots to get a foothold when germination is in progress. There are two ways in practice of covering these seeds. The first is to sift soil over them through a fine screen; one made from mosquito wire is good. The other is simply to sprinkle the soil over by hand, shaking it over as it passes through between the thumb and two forefingers.

As soon as the actual sowing is completed, sprinkle liberally with water,

using a fine rose sprinkler on the can. Cover the seed bed with paper. Germination will begin more regularly in the dark because a steady condition of moisture can thus exist without interruption. Exposure to light and air cause drying of the surface of the seed bed. This is better avoided.

As soon as the tiny seedlings are large enough to handle, they should be transplanted into other containers, preferably flats that are at least 3 inches deep. Space the seedlings 2 inches apart each way in soil similar to that of the seed bed, except for the addition of a small quantity of humus such as leaf mold, which is likely to give an extra stimulus to growth. Vegetable plants handled in this way will be ready by the end of March for moving to a cooler location such as a coldframe, where they may be acclimatized to outdoor conditions.

When one is fortunate enough to have the use of a greenhouse and coldframe, there is reasonable likelihood that good sturdy plants will be ready to start in the outdoors in April.

When a greenhouse is perhaps too great a luxury, similar results can be secured from a hotbed, which is simply a coldframe in which some kind of artificial heat arises from below. The time-worn method of providing this is by fermenting horse manure, although other kinds of organic matter may be used. Whatever the material, it should be of uniform texture; that is, if strawy horse manure and leaves are used, they should be thoroughly mixed together. This should be built into a square pile about two feet deep and fairly solid throughout, especially in the middle. The area should be such that the coldframe or box at hand can be placed on top, leaving a portion of the fermenting material on the outside all the way around. This insures an equal distribution of heat over the area inside the frame. To some this may at first appear too expensive and laborious a procedure, but when one considers that this manure will soon be decomposed and just the best thing for digging into the vegetable plot later, the outlay and bother will be largely repaid.

In such a hotbed some early vegetables may be sown directly in the frame, and here one may raise the vegetables recommended as in the greenhouse. Great care should be given to ventilation, and a small opening at the edge of the sash which covers the hotbed should always be provided for the passage of air, except when it is extremely cold outdoors, so that there will be an exit for unhealthy fumes.

In such a hotbed some early vegetables may be sown directly in the soil in rows or by broadcasting the seeds. Kinds commonly grown in this way are early varieties of lettuce, carrot, beet and radish. If sown in late February or early March, these will be ready for harvesting in May, the radishes coming earlier. This kind of vegetable forcing requires a good deal of care. Water is needed frequently because the heat from the fermenting material dries the soil quickly. Constant attention to good ventilation will obviate spindly growth.

Perhaps the most convenient method of making a hotbed frame for city gardeners is by the use of electricity. A lead-covered cable is zig-zagged and attached to a metal frame 6 inches below the soil, the heat being regulated by a thermometer and thermostat. In such a frame it is possible to raise many kinds of vegetables without the use of unwarranted time and energy.

Vegetables that require a slightly higher temperature for the germination of seeds are naturally those that are native to warmer regions. These include pepper, eggplant, and tomato, for which a minimum temperature of 58° to 60° F. is necessary. Eggplant and pepper may be started early in March, the method of handling except for the provision of a slightly higher temperature being the same as that recommended for cabbage.

If tomatoes are wanted, it is an excellent plan to make two sowings, the first in February if possible. Indeed, if no better arrangements exist, tomatoes will germinate and grow very well in the window garden. They should be potted singly into 2½- or 3-inch pots before becoming too spindly, as they will surely do in the seed-bed. See that the pots are well drained; a good garden loam will make a suitable compost. Plant so that the roots and stem are inserted as deeply in the pot as possible. As they grow, avoid overcrowding. Tomatoes love much light and the plants should never be so close as to touch each other. When the first pots have become filled with roots, the plants may be repotted into 5- or 6-inch size pots where they will stay until time for planting outside, which should not be before May 25 in the New York area. By that time small green tomatoes will be found on the vines. When these are ripe they will provide for home needs until the plants that were sown in flats April 1 are producing, thus extending the season. The April sowing will comprise the main crop. If sown in a warm greenhouse or a hotbed they will grow rapidly.

If one desires a large onion, this vegetable may also be started indoors by sowing in February in a hotbed. In April the seedlings may be transplanted to the garden, spacing them in the rows 6 inches apart. If more than one row is planted the rows should be at least 1 foot apart. The variety **Ailsa Craig** is the best for early sowing with a view to a large vegetable. These are, however, not as good for winter storage as are some other varieties that are sown directly in the garden as soon in spring as the soil is dry enough to tread upon without being sticky.

The cucumber is considered by many as important for salad during hot summer days, and we can extend the season of this plant by sowing early. Around New York it is wise to delay setting it out until near Decoration Day, and seeds can be sown in the garden only about a week or ten days before that time. So, if we sow about April 15 in the hotbed, in the greenhouse, or even in the coldframe, if we have "hotkaps" or preserve jars with which we can further protect them individually, we have nice material by June 1 that will bear much earlier than sowings that are made

in the open during May. The seeds are sown one-quarter of an inch deep in small pots, using a good garden soil. It is advisable to place two seeds in a pot, pulling out the weaker when germination is completed. An old-fashioned method of germinating cucumbers is by inserting the seeds in a piece of sod about 3 inches square, the sod taking the place of pots. The same can be done with other plants of this group, and it might be worth while starting some squash of the zucchini variety in the same way if an extra long season of this fairly popular vegetable is desired.

Dr. J. H. Barnhart Now Bibliographer Emeritus

FOR a longer period than any active member of the staff can remember, Dr. John Hendley Barnhart has been the fount of knowledge for matters biographical and bibliographical at the New York Botanical Garden. The questions he has answered have often come from institutions and scientists in distant parts of the world, as well as from home, for no other man ever seemed to possess his vast store of information or his patient ability to unearth obscure facts. His assumption on January 1 of the title of Bibliographer Emeritus at the Garden has in no way lessened the requests for the type of information which his unique mind and his thousands of record cards have made him especially equipped to answer.

Dr. Barnhart has been at the Garden since January 1903, when he was appointed Editorial Assistant, on a part-time basis at first. In October 1907 he was named Librarian, and in January 1913, Bibliographer.

A graduate of Wesleyan University at Middletown, Conn., in 1892, Dr. Barnhart received the degree of A. M. there the following year, then undertook the study of medicine at Columbia, receiving the degree of M.D. in 1896, at the age of 24.

During the next few years he was engaged much of the time in botanical studies and in the amassing of a fine botanical library and herbarium, which are now incorporated in the collections of the Botanical Garden. His prevailing interest in things botanical had asserted itself at an early date. In 1904 he was serving as Treasurer and as Secretary *pro tem* of the Botanical Club of the American Association for the Advancement of Science. Meanwhile, he had become a staff member at the New York Botanical Garden, and at the same time he was elected Editor of the Torrey Botanical Club, of which he had already been a member for 12 years.

Dr. Barnhart had two commanding botanical interests from the earliest days —one, the local flora of the vicinity of New York, and the other, nomenclature. His taxonomic research has been chiefly restricted to the Lentibulariaceae, or Bladderwort family; but he has never tired of working out botanical puzzles, no matter what the family of the plant concerned.

An extraordinarily logical mind fitted him for work on botanical nomenclature, and his first writing in this field, concerned with the naming of plant families, was done before he began his career at the New York Botanical Garden. During the great years of dispute, from 1900 to 1910, he was an active fighter, and he has continued his interest in the subject ever since. As a member of the International Committee on Nomenclature he took a prominent part in formulating the International Code which was adopted at the Botanical Congress at Vienna in 1905, and later modified at Brussels in 1910, and again at Cambridge, England, in 1930.

A love of old books turned him naturally to botanical bibliography, and from that to botanical biography. The amazing amount of detail which he sought out and remembered (as well as kept on file) has made his knowledge in these two related fields already almost legendary. And still he continues to pursue his interests in the library.

Ornamental Deciduous Shrubs

By P. J. van Melle

THIS is the concluding article of the series first presented under this title in the Journal of December 1940 and continued in the January number. It is intended as a brief review of hardy and useful kinds of shrubs recommended for use within a radius of 60 miles of New York City, and has been adapted from part of the series of lectures on "The Cultivation of Trees and Shrubs" in the TWO-YEAR COURSE IN PRACTICAL GARDENING *given at the New York Botanical Garden in the autumn of 1940. An alphabetical index to the shrubs treated in all three instalments appears at the end of this article.*

STORAX FAMILY

Styrax japonica and ***S. Obassia*** are handsome large Japanese shrubs or small trees, doubtfully hardy inland and north of New York City, but growing to 30 ft. high where entirely hardy. Use them only in sheltered and sunny situations and in well drained, loamy soils. Both make broad shrubs with spreading branches, bearing drooping clusters of pure white flowers in late May or early June. *S. Obassia* is the handsomer of the two. Rather too large for free use, but a single specimen, where hardy, will look well on a large lawn.

SWEETLEAF FAMILY

Symplocos paniculata, the Asiatic Sweetleaf or Turquoise-berry, is a large broad shrub occasionally over 20 ft. high, with fragrant small white flowers arrayed hawthorn-like in flattish panicles in May or June, followed in September by clusters of turquoise-blue berries which are of extraordinary beauty, but are soon eaten by birds. The flowers are inconsistently dioecious, so that one had better select fruiting plants in nurseries. Rather too large for border use, it makes a good specimen shrub.

The turquoise-berry, Symplocos paniculata, is at its best in September when it is in fruit.

OLIVE FAMILY

FORSYTHIA. Golden-Bell. Familiar shrubs, mostly from China, commonly furnishing the first touch of spring in American Suburbia Though handsome, they are rather large for free use on small properties, as they often grow to about 9 ft high and reach even greater width. For maximum floral effect, at least part of the branches that have finished blooming should be cut back hard each spring, so as to keep inducing new growth from the base. Too often, the shrubs are hacked down and mutilated beyond resemblance to the handsome, stately, rounded beauty of which they

are capable. Forsythias flower in early spring before their leaves appear, on wood of the preceding year's growth, the exact flowering time varying with early or late springs.

F. suspensa makes a robust shrub with upright stems and pendulous sweeping branches.

F. viridissima does not have that pendulous branching habit, but is an upright shrub.

F. intermedia is a hybrid of the two, intermediate in habit, showier in flower than the parents. A particularly fine variety of it is known as *spectabilis*.

F. ovata, earlier to flower than most, and not as effective in bloom, is to be recommended in cold climates where the flower-buds of the other kinds may be destroyed by frost.

Syringa ***vulgaris,*** the common Lilac, has numerous named horticultural varieties, from among which one may easily select his favorite shades. Single-flowered forms make the more shapely, pyramidal clusters and are often more floriferous than the doubles. In the latter, old flowers are likely to remain on the dry inflorescences, making them the more unsightly. Since lilac roots sucker freely, varieties grafted on the common lilac would be likely to be run out by wild growth from the roots. Therefore, they are commonly grafted on privet stock and planted in nursery rows deeply enough to encourage the development of roots above the grafts, following which the privet roots are reduced by pruning. Hybrids on their own roots, raised from cuttings, are also available and are more desirable.

The Hybrid Lilacs, known also as "French Lilacs," need no description here. Their value is exclusively in the showy trusses of fragrant flowers, which are one of the delights of the Maymonth, and so universally beloved that practically every home-owner insists upon one or more on the place—an incense offering, so to say, to spring, but one which the devout will be wise to make in some not too prominent place in their landscape. For, besides the fleeting floral value, these lilacs contribute nothing in the way of foliage or refined appearance, being coarse and dull of leaf, more leggy than the original *S. vulgaris,* and otherwise unattractive as to habit, retaining, moreover, unsightly dry seed-capsules, too high for convenient removal. In fact, on a basis of cold landscape esthetics, they cannot be scored highly. One sets them down as ideal shrubs for lilac collections, and concedes them a peculiar and pleasing, rural, pictorial value about farm houses and other small country structures. In the suburban landscape they serve best in the background of shrub borders, in a corner of the vegetable patch, or as tall screens. They like a limy soil and an occasional top-dressing of old cow manure. Their leaves are subject to mildew, against which sulphur dustings are employed; their stems to borers, which must be hunted out with wires and the holes plugged with nicotine paste; and the stems and branches to various scales, for which oil sprays are applied in the dormant state and nicotine-soap sprays in summer.

S. ***persica,*** the Persian Lilac, is a truly attractive, narrower-leaved, round shrub to 6 ft. or more, with smaller, rounder clusters of pale lilac, peculiarly fragrant flowers It serves very well, indeed, in open or lightly shaded borders. There is a white-flowered variety, *alba.*

S. ***chinensis*** is a hybrid, known also as *S. rothomagensis* (after the French City, Rouen, where it originated). Its habit and flower clusters, which are intermediate between *S. persica* and *S. vulgaris,* reveal its origin. The odor of the flowers is considered unpleasant by some. There are single- and double-flowered varieties in both purple and white. It makes normally a large bush considerably wider than high.

S. ***reflexa,*** from China, is worth planting in a limited way for its long pendulous clusters of pink flowers, which are darker in the bud. To 10 ft. The odor of the flowers is not altogether pleasant.

S. ***Josikaea,*** the Hungarian Lilac, and *S.* ***villosa,*** from northern China, are two greatly over rated, erect, stiff, bold and emphatic shrubs with dark green, rather stiff leaves and pale lilac, scentless, unattractive flowers unseasonably late, at a time when better flowers abound in

Styrax Obassia, considered the choicest of the storaxes, has exquisite white flowers late in the spring.

the border. These two are incapable of any pleasing effect or refined association, and should be avoided on the small property.

S. anurensis (S. japonica), growing to 30 ft. high and ranking rather as a tree than as a shrub, is still coarser, but is redeemed for a brief spell in late June or in July by immense, broad panicles of white flowers with a strong, unpleasant odor. Avoid it for the small suburban property.

Chionanthus virginicus, the Fringe-tree, native from Penn. southward, makes a handsome, large, wide-spreading, bold-branched shrub or small tree of loose habit, mostly less than 20 ft. high, clothed with bold, 8-in., oblong leaves which turn yellow in autumn. The chief value is in large drooping panicles of white to greenish-white flowers appearing in May at the end of last year's growths. The flowers are dioecious, those of the staminate plant the more showy, while the pistillate bears ornamental dark blue drupes, ripening in September. The shrub thrives best in a sunny situation in moist, sandy loam. Inland, above New York City, it should have a somewhat sheltered place. A handsome individual lawn specimen, very attractive in bloom.

C. retusus is an Asiatic species of more recent interest, not superior to the native.

LIGUSTRUM. Privet. Though familiar in the form of clipped hedges, the privets make excellent untrimmed shrubs and serve well, when so used, for shady borders. They retain their foliage late in the season and bear, in June, more or less showy, mostly terminal panicles of creamy or white flowers, followed in autumn by jet black berries, quite attractive in some species.

L. ovalifol'um, called California Privet, though a native of Japan, is most familiar. It is widely used as a material for clipped hedges, though it is not sufficiently hardy here for this purpose.

L. ibolium which is a hybrid of the above, and ***L. amurense,*** a species from northern China, are both considerably hardier. All of these are similar in their upright habit but *L. amurense* lacks the glossiness of leaf of the two others.

L. obtusifolium var. ***Regelianum,*** the Regel Privet, is one of the most valuable of all shrubs for a multitude of purposes. In its best form, a rather round-topped shrub to 6 ft. or more, with distinctly spreading, overlapping branches creating a shingled effect. Valued mainly for its neat habit. Best propagated from lateral cuttings. It grows in any reasonable soil and has a peculiarly tidy, dignified appearance, with grayish green leaves and small whitish panicles of flowers along the branches.

L. vulgare, from Europe, is of rather upright habit, to about 10 ft. high, with bold terminal panicles of flowers and fruits.

L. Quihoui, from China, to about 9 ft., is distinctive and dark-leaved, flowering in August.

Jasminum nudiflorum, Jasmine, is a low, rambling, and rooting shrub of rapid growth, useful for the mildest parts of our region. It has angular green branches, pinnate leaves consisting of 3 leaflets, and in early spring a profusion of clear yellow flowers somewhat suggestive of individual forsythia blossoms all along the branches. Doubtfully hardy even in sheltered places above New York City. Where hardy, it may be trained against walls to resemble a vine, or used as a drape over retaining walls.

LOGANIA FAMILY

Buddleia alternifolia, a Butterfly Bush from northern China, which in late years has become popular, is the only top-hardy species in our region. A large shrub, to 10 ft. or less, of pleasing habit, with spreading, arching, outer branches, all along which are strung in June small dense clusters of bright lilac flowers. As it blooms on wood produced in the preceding year, it should be pruned immediately after the flowering season. Like all buddleias, it prefers a sunny situation It thrives in any reasonable soil.

B. Davidi, the Orange-eye Buddleia from China, usually dies down to the ground every winter, then flowers in late July or August on newly produced wood, bearing spike-like, terminal inflorescences, which attract butterflies. The stems grow to a height of 6 to 8 ft. in a summer, and require staking where tidiness is important. These shrubs are not easily placed in the small landscape composition. Because of their stubby, cut-back appearance in spring they may disturb the picture of the shrub border, but may serve as terminal shrubs for a perennial border, or in some comparable place. Numerous varieties are available in various shades of purple, names of which will be found in catalogs.

VERVAIN FAMILY

Callicarpa dichotoma (*C. purpurea*), sometimes called Beauty-berry, is a useful and decorative Japanese-Chinese shrub, grown mainly for the beauty of its small rounded clusters of lilac berries borne in autumn in the axils of the graceful, arching branches of the current season's growth. A unique and valuable effect, not duplicated by any other shrub. To about 4 ft. high, fairly hardy above New York City. If occasionally killed to the ground, it will develop and fruit in the same manner on new growth from the base.

C. japonica has much the same value. In both species the small pinkish or whitish flowers are rather insignificant.

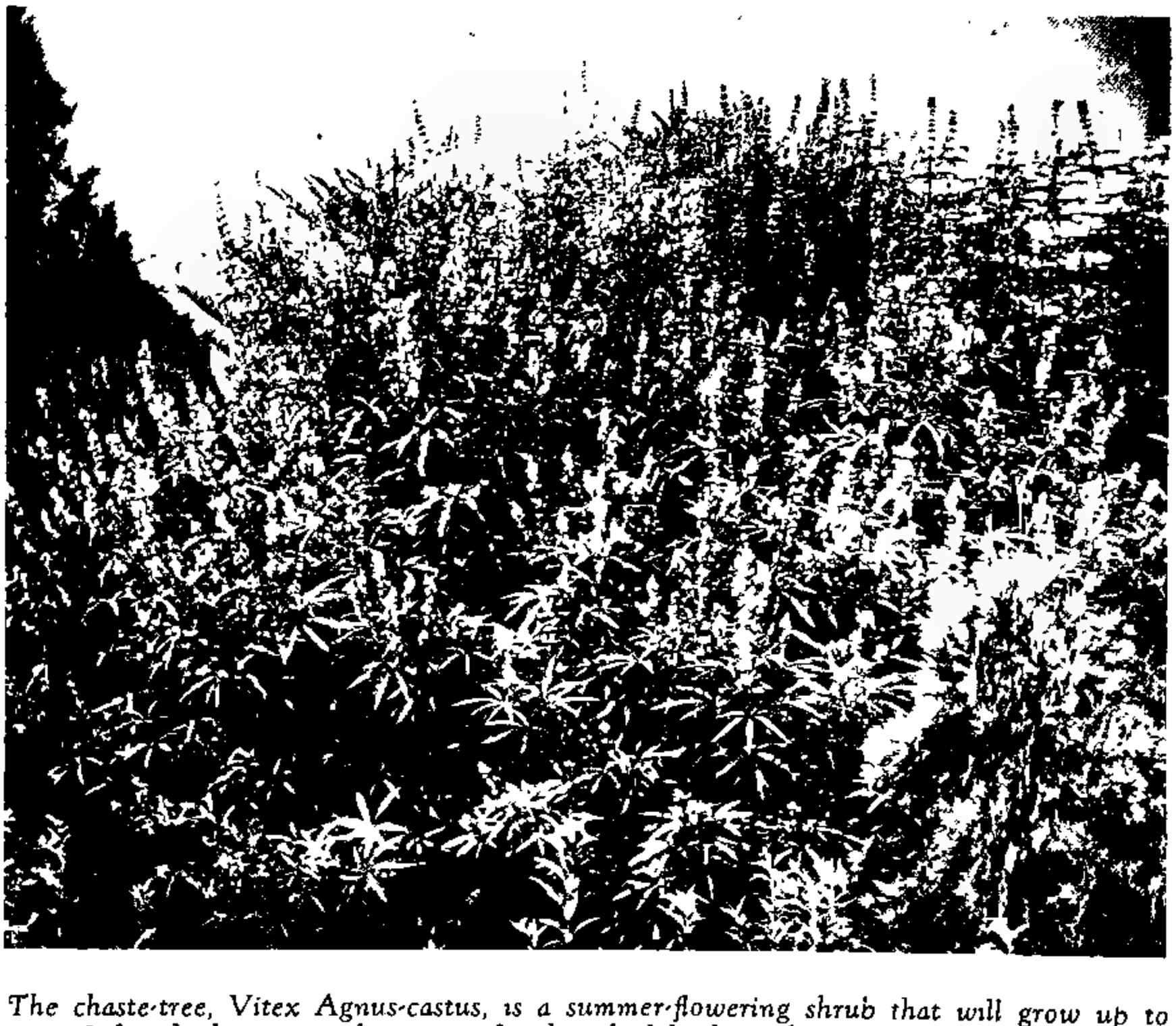
Vitex Agnus-castus, the Chaste Tree, a Eurasian species, is a shrub of extraordinary interest and beauty. A so-called "freeze-back," at least above New York City. Where fully hardy, it will sometimes grow to 9 ft.; farther north, it makes a much shorter annual growth from the base. Even when it does not kill to the ground, it may be best practice to cut it back close to the ground in the spring, thus ensuring a neat, short growth. The leaves are made up of 5- to 7-fingered leaflets, gray and aromatic. In late June or July the shrub produces, terminally on the current growth, uncommonly effective lilac to purple or blue spikes in a paniculate arrangement. It thrives best in a light sandy soil in full sun. Var. *latifolia* (also known as *V. macrophylla*), is just a large-leaved and showy form of the species.

V. Negundo is of similar value, but rather less handsome in flower. This is a coarse-rooted shrub, as is also *V. Agnus-castus*. Both are best planted in the spring, as they can hardly be dug with a ball of earth. Beware of dirty white or pale dull-bluish-flowered forms.

Clerodendron trichotomum, Harlequin Bush, from eastern China, is, at least in the colder part of our region, another freeze-back, flowering on growth newly produced from the base, and spreading into large patches from suckering roots. Where it is top-hardy, it may well be cut close to the ground in the spring, to ensure a tidy growth. An exotic-looking shrub of erect habit, clothed with large, gray, soft-hairy, oval, pointed leaves to 6 in. or more long, with a very unpleasant smell when crushed. In August or September it produces from the uppermost axils clusters of rather insignificant, whitish, sweetly fragrant flowers, each enveloped in prominent reddish calyx. This effect is long-lasting and is followed by ornamental berry-like drupes that are first purple, finally blue. A striking shrub, but hardly suitable for border use, and best placed where the roots may ramble and form large patches, as in uncleared lots or on rough slopes. It will grow around 6 ft. high in a season.

MINT FAMILY

Elsholtzia Stauntoni is a low but erect shrublet from China, mostly not over 2 ft. high, valued for its showy, dense, clustered, one-sided spikes of lilac flowers terminating the season's growths in September and October. A pretty little plant for the foreground of the border, treated as a die-back shrub.



The chaste-tree, Vitex Agnus-castus, is a summer-flowering shrub that will grow up to 9 feet high in a single season if it has died back to the ground over winter.

HONEYSUCKLE FAMILY

SAMBUCUS. Elder. Large and coarse shrubs, mostly upward of 10 ft. high, with pinnate leaves, broad cymes of fragrant white flowers in early spring or summer, followed by scarlet, purple or black berries. Mostly too coarse for the average small shrub border, and best reserved for large naturalistic and rural plantings.

S. canadensis maxima, which is sold as *S. pubens maxima,* is a very large and impressive shrub with leaves 15 in. or more in length and flower clusters sometimes 2 ft. or more across, followed by purplish-black berries ripening in September.

VIBURNUM. An important genus, containing many valuable and decorative shrubs for landscape uses, some of them attractive in flower and others valued chiefly for their autumn coloring or for their showy red, black or deep-blue fruit. Many of the viburnums are too large for use in the average border, and are best placed as individual specimens on lawns. One of these is *V. tomentosum.* Most of the native kinds succeed well in the shade With certain exceptions, they prefer a soil on the damp side.

Group I NATIVE KINDS

V. trilobum (*V. americanum*), the Highbush Cranberry, to 10 ft. or more, is planted for its brilliant red foliage in autumn and for its clusters of red berries which ripen in August and remain on the bush in winter (in dry condition), to the delight of the birds. This shrub is less subject to scale than is its European equivalent, *V. Opulus.*

V. acerifolium, to 5 ft. high, is valued mainly for its purplish autumn color. It succeeds well under trees and in dryish soils.

V. prunifolium, the Black Haw, with showy cymes of white flowers in the spring and bluish-black fruit, grows to 12 ft., or sometimes much more, and succeeds in dryish places.

V. Lentago, Sheepberry or Nannyberry, is an erect shrub to 15 ft. or more, with attractive white flowers in May or June, followed by bluish-black fruit in autumn.

Group II—EUROPEAN KINDS

V. Opulus, The European Highbush Cranberry, resembles the native *V. trilobum* in habit, leaf, flower, and fruit, and, being greatly subject to attack by scale, is best replaced by it. Var. *roseum,* more popularly known as var. *sterile,* the Guelder Rose or Snowball, is an old-time favorite with pure-white globose flower-heads. This shrub is always infested with aphids and, for that reason, cannot be recommended. While the European highbush cranberry is attractive in fruit and for autumn color, its habit of growth and winter appearance are not particularly good.

Group III LARGE ASIATIC KINDS

V. tomentosum is a handsome, round-topped shrub to 10 x 10 feet or more, with a pleasing, horizontal branching habit and strongly ribbed leaves which become wine-red in autumn. About Decoration Day, the flat spray-like branches are bedecked with large flat cymes of pure white flowers. The ultimately blackish fruit is very handsome in the unripe red stage in summer. Var. *sterile* (*plicatum*) is an even handsomer shrub with globose clusters of sterile white flowers, and leaves more nearly bronze-green. The variety is less hardy than the type, and more finicky about transplanting. It should be moved with a ball of earth.

V. setigerum (*V. theiferum*) is a large shrub, about 10 x 10 ft., rather erect and sparsely leaved while young. It is valued chiefly for its handsome drooping clusters of ultimately red fruit. Even more attractive is the variety *aurantiacum,* with fruit of orange-yellow. The somewhat shiny, dark green leaves turn purplish or bronze in autumn.

V. rhytidophyllum is a broad shrub, to 9 ft. or more, distinguished by very long, narrow, pointed, wrinkled, and somewhat shiny leaves, which, in places well sheltered from winter sun and wind, remain throughout the winter. The shrub has little floral value; the fruit ripens from red to black. The foliage is rather too large and coarse for use in small borders or in small-scale landscapes, and has, moreover, something of the disagreeable odor for which certain of the viburnums are notorious.

V. dilatatum. A round-topped bush, mostly not over 7 or 8 ft. high, with strongly ribbed leaves which turn a beautiful red in autumn, and bearing showy cymes of small, brilliant-red fruit, displayed all over the top of the bush. This is one of the handsomest of the snowball types desirable for border use.

V. Wrightii, with purplish red autumn foliage and red fruit, is in a class with *V. dilatatum,* but of broader, more spreading habit.

Group IV—SMALLER EXOTIC KINDS

V. Carlesii, mostly less than 6 ft. high, forms a broad loose shrub, with broad, dull green leaves, the branches terminated by showy round clusters of pink, sweetly fragrant flowers in the spring. This pretty and delightful shrub ought to be freely planted, especially near the house, so that the odor may be fully enjoyed. The foliage is much troubled with a leaf-spot disease, which may be controlled with Bordeaux spray.

V. Burkwoodii is of similar habit with larger clusters of smaller individual flowers, also pink and fragrant.

V. fragrans, somewhat taller, also belongs in this relationship; it has rosy flowers in April or May, rather less attractive than the two other kinds.

SYMPHORICARPOS. This genus is best known by the Snowberry, though it includes several other useful shrubs. The three treated here all sucker freely from the roots.

S. albus var. *laevigatus,* the Snowberry, is a shade-loving shrub with tiny, insignificant pinkish flowers in June, followed by large, showy, juicy, white berries that burst with a snapping sound when you step on them. This is, indeed, a very useful and decorative, though common shrub, to about 6 ft. high, of rather straggly, informal growth; one of the most satisfactory shrubs for heavily shaded places. The type *S. albus* is of much lower growth, to 3 ft., and much less commonly used.

S. orbiculatus, the Indian Currant or Coralberry, has much less attractive, smaller, duller leaves, and is hardly worth growing except in wild gardens, where the numerous small dull red berries strung thickly along its stems in late summer and autumn have a certain attraction.

S. Chenaulti, a hardy hybrid of the Indian Currant and a more tender Mexican species, is the most valuable of all, for it gives an exceptionally graceful foliage effect, and bears pink, white-cheeked berries larger than those of *S. orbiculatus.* Excellent for the foreground of the border, growing to about 3½ ft. high. One of the most useful stand-by shrubs.

ABELIA. Attractive and highly decorative shrubs with glossy green or bronze-tinted foliage, of loose, graceful, spreading or drooping habit, flowering from midsummer on, along the branches of the current season's growth. Therefore, all those kinds which are root-hardy in our region may be grown even though they are killed to the ground each winter.

A. grandiflora, a hybrid much planted in southern gardens, where it is semi-evergreen and grows to 6 ft. or more in height, is the one species now commonly grown outdoors in the North. We use it here as a low filler shrub in foundation or other groupings, or as a foreground plant in the shrub border. White, pink-flushed flowers in panicles on the lateral branchlets, from June till frost. If grown from cuttings and carried along in small pots through the winter, this little shrub may well serve even as bedding material.

A. Engleriana and *A. Zanderi,* both from China, are other abelias which should prove hardy enough, though they are as yet little tested in these parts.

Kolkwitzia amabilis. Beautybush. One of the prettiest of all flowering shrubs, the flowers suggestive of miniature weigelas, soft pink with yellow throat, produced in great abundance along the graceful arching branches. The foliage is gray-green, unobtrusive, and it persists well into the autumn months. After the flowers have faded in June, the fruit, though not showy, remains effective on the bush. This shrub rates high for its attractive and diffused appearance, and may well, in the border, take the place of the much coarser and less hardy weigelas. The species hails from China. It will grow to 8 or 9 feet high, but may easily be kept lower.

WEIGELA. This genus is represented in gardens mainly by a group of hybrids which are catalogued under horticultural clonal names. They are cheerful, floriferous border shrubs with rather coarse and unattractive foliage, flowering from late May to early June, the branches of the preceding year's growth heavily laden with trumpet-shaped flowers in shades of pink and red and white.

They should be pruned hard directly after the flowering season by cutting back this year's flowering stem to encourage the development of vigorous new shoots on which the next spring's flowers will be borne. In the northernmost part of our region the weigelas are likely to suffer more or less winter injury, and in those parts there has been in late years a tendency to plant, instead, the beautybush, which somewhat resembles the weigela in floral effect.

LONICERA. Honeysuckle. The larger shrubby kinds are valuable plants for the background of shrub borders and, since they endure shade well, also for shaded and woodland areas. They are more or less effective in late May or early June with their display of white, yellowish, or pink flowers, and also later in the summer when these are succeeded by round, red (or in some kinds yellow) juicy berries,

One of the handsomest of the viburnums is V. dilatatum, with brilliant red fruit and foliage in the fall.

Viburnum tomentosum var. sterile is an Asiatic shrub popular in American gardens because of its abundant white flowers the last of May, the clusters of fruit which turn from red to black, and the wine-red autumn leaves.

which do not last long. *Lonicera* is a large genus, containing a great many kinds of shrubs suitable for border and other uses, as well as many attractive twining vines, some of which may well be used as ground-covers.

L. Morrowii, widespreading, to 7 ft. high, is most commonly planted. Var. *xanthocarpa* has yellow berries instead of the usual red. The flowers are white, changing to pale yellow.

L. tatarica, more erect and taller, is also much used. It comes in white and in red-flowered forms, all of them red-berried except in the var. *lutea* which has yellow fruit.

L. Maackii, from Asia, is much taller, to 15 ft. high, and it flowers and fruits much later, having fragrant white to yellowish flowers.

L. fragrantissima is a Chinese species with roundish, rather large, long-persisting leaves. A shrub of erratic, mostly irregularly spreading or sweeping habit. It is valued mainly for its exceedingly fragrant small flowers, produced, depending on weather, from late fall on, sometimes in mild spells in winter, sometimes in earliest spring. A sprig of it in flower, taken into the house, will delight everybody.

L. thibetica is a Chinese species intermediate in habit between the upright shrub and the twining vine honeysuckles, a shrub with prostrate branches which eventually pile up and form broad mounds, four feet or more in height, with glossy foliage, and bearing purplish-

pink flowers in May or early June. An informal shrub, hardly suitable for border use, and best employed in larger landscapes, to hide low stumps or rocks or to grow on rocky slopes.

L. japonica var. *Halliana*, Hall's Honeysuckle, is the most robust among the ground cover twiners. It makes an excellent quick cover for banks, but sometimes gets out of hand in larger areas and may become a nuisance. It has delightfully fragrant cream and yellow flowers.

COMPOSITE FAMILY

Baccharis halimifolia. Groundsel Bush. An effective erect bush of variable height, from 5 to 8 ft. in cultivation, native of our eastern sea coast, and valuable for planting on sandy soils near the shore, not always quite hardy far inland. It has angular branches and oblong to wedge-shaped, shiny, toothed leaves to 2 in. long. Flowers dioecious, inconspicuous, in September. In pistillate plants, these are followed by effective, snow-white, downy seed-heads.

Index to Ornamental Deciduous Shrubs

On this and the following page are listed the genera and species of plants that are treated by Mr. van Melle in his article on Ornamental Deciduous Shrubs appearing in the December, January, and February numbers of this Journal. Common and varietal names are not given here, but synonyms mentioned are included. The month is indicated by its initial letter. An asterisk means that the subject is illustrated.

ABELIA F39
Engleriana
grandiflora
Zanderi

ACANTHOPANAX J19
pentaphyllus
Sieboldianus

ALBIZZIA Julibrissin J15

AMORPHA J15
carescens
fruticosa

ARONIA arbutifolia D294

AZALEA J??
ledifolia
mollis
pontica
yodogava

BACCHARIS halimifolia F42

BENZOIN aestivale D289

BERBERIS D288
dictyophylla D288, D290*
koreana D288
Thunbergi D288
Vernae D289
vulgaris D288
Wilsonae D288, D289

BUDDLEIA F36
alternifolia
Davidi

CALLICARPA F36
dichotoma
japonica
purpurea

CALYCANTHUS D289
fertilis
floridus

CARAGANA arborescens J15

CELASTRUS J17
articulatus
orbiculatus
scandens

CHAENOMELES D294
lagenaria
japonica D295

CHIONANTHUS F35
retusus
virginicus

CLERODENDRON F37
trichotomum

CLETHRA alnifolia J20, J21*

COLUTEA arborescens J15

COMPTONIA D288
asplenifolia

CORNUS J20
alba
florida
Kousa
mas J19*
stolonifera

CORYLOPSIS pauciflora D292

COTINUS J16
americanus
Coggygria

COTONEASTER D294
adpressa
apiculata
Dielsiana
divaricata
Franchetii
horizontalis
microphylla
racemiflora
rosea
salicifolia
Zabeli

CYDONIA Maulei D295

CYTISUS scoparius J15

DAPHNE Mezereum J19

DESMODIUM J16
penduliflorum

DEUTZIA D290
gracilis
purpurascens
rosea
scabra
Sieboldiana

ELAEAGNUS J19
angustifolia
argentea
commutata
longipes
multiflora
umbellata

ELSHOLTZIA Stauntoni F37

ENKIANTHUS J20
campanulatus
cernuus

EUONYMUS J16
alata J16
americana J17
europaea J16
patens J16
yedoensis J17

EXOCHORDA Giraldii D294

FORSYTHIA F34
intermedia
ovata
suspensa
viridissima

FOTHERGILLA D292
major D291*

GORDONIA alatamaha J18

HAMAMELIS D292
mollis
vernalis

HIBISCUS syriacus J18

HYDRANGEA D291
arborescens
macrophylla
opuloides
paniculata
quercifolia
radiata

HYPERICUM J18
aureum
calycinum
frondosum
Kalmianum
prolificum

ILEX J16
laevigata
verticillata

INDIGOFERA Kirilowi J15

JASMINUM nudiflorum F36

KERRIA japonica D295

KOLKWITZIA amabilis F39

LESPEDEZA Thunbergii J16

LIGUSTRUM F35
amurense F36
ibolium F36
obtusifolium F36
ovalifolium F35
Quihoui F36
vulgare F36

LINDERA Benzoin D289

LONICERA F40
fragrantissima F41
japonica F42
Maackii F41
Morrowii F41
tatarica F41
thibetica F41

MYRICA D288
caroliniensis
cerifera
pensylvanica

NEILLIA sinensis D292

NEMOPANTHUS J16
mucronatus

NEVIUSIA alabamensis D292

PAEONIA D288
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suffruticosa

PHILADELPHUS D290
coronarius
microphyllus

PHOTINIA villosa D294

PHYSOCARPUS D292
monogynus
opulifolius

POTENTILLA fruticosa D295

PRUNUS D296
glandulosa
triloba

RHAMNUS J18
cathartica
Frangula

RHODODENDRON J21
arborescens J22
calendulaceum J22
dahuricum J22
japonicum J22
luteum J22
molle J22
mucronatum J22
nudiflorum J22
roseum J21
Schlippenbachii J22
Vaseyi J22
viscosum J22
yedoense J22

RHODOTYPOS D295
kerrioides

RHUS J16
aromatica
canadensis
Cotinus

ROBINIA hispida J15

ROSA D295
Ecae D296
eglanteria D296
Hugonis D296
rubrifolia D296
rugosa D296

SAMBUCUS F38
canadensis
pubens

SORBARIA D293
Aitchinsonii
assurgens
sorbifolia

SPIRAEA D292
arguta D293
Billiardii D293
Bumalda D293
callosa D293
cantoniensis D292
Douglasii D293
japonica D293
opulifolia D292
prunifolia D293*
Reevesiana D292
Thunbergii D293
trichocarpa D292
VanHouttei D292

STEPHANANDRA D292
incisa
Tanakae

STEWARTIA J18
ovata
pentagyna

STYRAX F33
japonica
Obassia F35*

SYMPLOCOS paniculata F33*

SYMPHORICARPOS F39
albus F39, D289*
Chenaulti F39
orbiculatus F39

SYRINGA F34
amurensis F35
chinensis F34
japonica F35
Josikaea F34
persica F34
reflexa F34
rothomagensis F34
villosa F34
vulgaris F34

TAMARIX odessana J18

VACCINIUM J20
corymbosum
hirsutum
pensylvanicum
stamineum J21

VIBURNUM F38
acerifolium F38
americanum F38
Burkwoodii F39
Carlesii F39
dilatatum F39, F40*
fragrans F39
Lentago F38
Opulus F38
prunifolium F38
rhytidophyllum F38
setigerum F38
theiferum F38
tomentosum F38, F41*
trilobum F38
Wrightii F39

VITEX F36
Agnus castus F36, F37*
macrophylla F36
Negundo F37

WEIGELA F40

XANTHOCEROS J17*
sorbifolium

ZENOBIA pulverulenta J20

Plant Life And The Law of Man

II—*Bounties*

By E. H. Fulling

THE emergence of man from his prehistoric nomadic type of life to settled communal existence in various parts of the world has always been associated intimately with the establishment of some form of permanent agriculture, and it was in regions of unusual agricultural fertility that the early civilizations first arose, in the river valleys of the Nile, the Euphrates and the Tigris. In less favorable areas of the earth, the indomitable spirit of embryonic cultures overcame seemingly insurmountable conditions, as in Peru, where terraced agriculture was practised by the Incas; but wherever the land, the raising of annual crops was invariably a prerequisite for permanent settlement and the basis upon which social developments were founded. Ages later, further colonization from these early civilizations was also dependent upon crops.

During these countless ages, agricultural progress was slow, but it was sufficient to meet the early needs of man. Later on, the tempo had to be increased, lest the efforts toward further expansion into the world perish. One of the means has long been fosterage by governments—which, after all, are but outgrowths of the social developments founded upon the earliest forms of agriculture. This governmental assistance has found expression in a variety of ways, but one which particularly concerns us has been in the form of monetary payments dispensed from public funds and awarded to individuals to encourage them in producing certain crops. Such payments are known as bounties, and consideration of them brings us to this second chapter in our story of man and his legal relations as a result of his dependence upon plants.

Colonial and State Bounties

Spanish exploration in America was ill fated, for it was founded, at least at first, upon exploitation and not upon permanent colonization in association with established agriculture. Later, English settlement, destined in the long run to surpass other attempts, also had its early setbacks, and the "starving time" of Jamestown and the privations of Plymouth Colony are famous in the annals of American history. Those episodes and many similar incidents in succeeding years were all the results, more or less, of inadequate agricultural facilities, and continual recurrence of them threatened the American colonists until finally the various governments, both of the mother country, England, and of the Colonies themselves, offered bounties to rectify matters. Some of them, it is true, particularly those which emanated from Parliament, were designed not so much for

the good of the colonists, as to augment the revenues of English stockholders. But whatever the motives behind them, they were all factors in fostering certain agricultural industries in America. They were enacted for various periods of time, and eventually all were discontinued for one or another reason. Some were short-lived because they were ineffective in accomplishing their purposes, and others were cancelled because of the high taxation required to support them. Some, on the contrary, were continued effectively many years. A few were so successful that eventually the industries which they promoted no longer needed this artificial support.

The idea of agricultural bounties in America was carried from colonial times through the nineteenth century and into the first years of the twentieth. In the following list [1] we note the crops upon which they were placed during more than two centuries of development in our country. Names in italics indicate the colonies up to the year 1800 in which the indicated bounties were enacted. Other names are those of states involved since 1800.

Barley: Maine
Beans: Maine
Beets, sugar: Delaware, Kansas, Maine, Massachusetts, Montana, Nebraska, New Jersey
Buckwheat: Maine
Carrots: Maine
Chicory: Nebraska
Coffee: California
Cotton: California, *Florida, South Carolina*
Flax: California, *Georgia, Maryland, Massachusetts, New Jersey, North Carolina*, North Dakota, *Rhode Island, South Carolina, Virginia*
Flaxseed: *Virginia*
Ginger: *South Carolina*
Hedge fencing: Minnesota
Hemp: California, *Connecticut, Florida, Georgia, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina,* North Dakota, *Pennsylvania, Rhode Island, South Carolina, Virginia*
Hempseed: *Virginia*
Hops: California, *Virgina*
Indigo: *Florida, Georgia, South Carolina*
Jute: New Jersey
Maize: Maine, *Georgia*
Mulberry: California, *Connecticut, Georgia, New Jersey*
Oats: Maine
Parsnips: Maine
Peas: *Georgia,* Maine
Potatoes: *Georgia,* Maine
Ramie: California, New Jersey
Rice: California
Rye: Maine
Sorghum: Massachusetts, New Jersey
Tea: California
Tobacco: California, *New Hampshire*
Trees
  Forest: Dakota Terr., Illinois, Kansas, Minnesota, Missouri, Nevada, North Dakota, Pennsylvania, South Dakota
  Fruit: California, South Dakota
  Shade: California, Connecticut, Minnesota, Nevada, Wisconsin
Turnips: Maine
Wheat: Maine, *Massachusetts, Virginia*

With only a few exceptions, the crops which received bounties in certain colonies during colonial times were not thus favored later in the states which evolved from those same colonies. Only flax in New Jersey, hemp

[1] The principal sources of data, in addition to court records, for this article have been:
a. Gray, L. C. & Thompson, E. K. History of Agriculture in the Southern United States to 1860. Carnegie Inst. Wash. *2* Vols. 1933.
b. Hannay, A. M. Bounties on Agricultural Products. U.S.D.A, Agr. Eco. Bibl. 20. 1927.

in New Hampshire, mulberry trees in Connecticut and wheat in Massachusetts received bounties in the same regions in both periods. On the other hand, certain crops which were favored in some of the colonies but which lost or no longer needed the sponsoring when those colonies became states, received legislative support later in other parts of the country. Bounties on cotton, flax, hemp, hops, mulberry trees and tobacco were all shifted to California when that state was being intensively developed during the nineteenth century.

Among the crops which were most frequently the beneficiaries of premiums were the dye-producing plants, for coal-tar products and anilin dyes were unknown in the colonies; an entire century, in fact, had to pass before the possibility of their replacing natural dyes even became suspected. In the eighteenth century, therefore, it was found necessary to stimulate the production of their natural sources, and indigo at that time was especially favored by legislative action. The dye is secured principally from the Asiatic *Indigofera tinctoria* and the West Indian *I. Anil,* though several species capable of yielding it are native to the United States. One of these, *I. caroliniana,* grew wild in the Carolinas, and early experiments were conducted upon it as a source of the coloring matter, to such an extent that in 1694 an act was ratified in South Carolina to provide special encouragement for production of the stuff. Two years later, however, the bounty was discontinued. Meanwhile, the industry was being developed in the lower Mississippi Valley. In 1742 the West Indian species was introduced into South Carolina, and when it was found that commercial indigo could be produced there, the colony offered a bounty and the British Government followed with another the next year. By 1747/8 the industry had so developed under this impetus that 138,334 pounds of indigo were exported from Charleston. Indigo thus became, along with rice, one of the two staple crops in South Carolina. Meanwhile, in 1734, Parliament had placed indigo on the free list, and a decade later the General Assembly of South Carolina provided a bounty of one shilling per pound of indigo exported, to continue five years, but the provision was repealed the next year because the taxation necessary to provide for payments became burdensome. In 1748 Parliament again offered a bounty and this time it was continued until the Revolution.

Cochineal and safflower were other dyestuffs promoted by colonial bounties. The former provided scarlet and crimson, and was also used in the production of carmine and lakes. The substance is secured from the body of a scale insect which feeds upon certain cacti, particularly on one known in Mexico, where it is native, as nopal, *Nopalea coccinellifera.* This source of dye has been almost wholly superseded since colonial times by the cheaper coal-tar products, but before the nineteenth century it was important in the coloring of wool and silk. To promote the industry meant also to encourage cultivation of the cactus upon which

the insects fed and were bred. Safflower, *Carthamus tinctorius,* which was imported from Eurasia, also is a source of a red dye which has long been used in the coloring of silks and rouge, and which likewise was in demand in colonial days. Its seeds yield an oil useful for lamps and cooking, and these qualities undoubtedly also accounted for its value in those days.

The production of flax and hemp also came in for their share of encouragement. In the eighteenth century sailing vessels were still the great conveyors of international and coastwise trade, and rope was an indispensable part of their rigging. In 1704/5 Parliament, eager to escape from dependence on the Baltic countries and Holland for this material, offered £6 per ton of "water rotted, bright and clean" hemp imported into England, and continued the bounty until 1737. Its retention on the statute books was a mark of hope rather than a measure of success, however, and the bounty was eventually allowed to expire because of "not having in the Course of many Years Experiment, produced any effect." Further encouragement had been offered in 1721 by exempting from import duty any hemp brought from the American Colonies, and flax, rough or undressed, was placed on the free list in 1731. About 1764 there was a revival of interest and Parliament granted a bounty of £8 per ton of hemp or flax for a period of seven years, and then reduced the award to £6 for the next seven years. It must be noted, however, that this bounty of 1764 was not designed to encourage production of hemp and flax, but was part of the British policy of discouraging manufacture in the American Colonies. It was thought that this might be accomplished by stimulating importation of hemp and flax into Great Britain and thus preventing the rope and textile business from flourishing too well in America, in which event importation of the manufactured articles from England would have been seriously curtailed.

Several colonial attempts were made to establish a silk industry and premiums were offered, not only on the raising of cocoons and the manufacture of silk itself, but also on the planting and successful cultivation of mulberry trees, necessary for the feeding of the silk-worms. In colonial Williamsburg today one can see very old, large and excessively gnarled mulberry trees still standing as mementos to the early attempts in colonial Virginia to be independent of the Orient in days when the silken finery of courtly attire was still the vogue.[2] Connecticut, Georgia and New Jersey sought to promote the industry by sponsoring the planting of mulberry trees, and then, years after their endeavors had become matters of history, California made a final attempt. It is in connection with this last effort that we shall later consider a particular instance of litigation.

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[2] The author can not vouch for these interesting trees in Williamsburg as being originals, but whether so or of later planting they bear testimony in either event to early American sericulture.

Finally, we should take note in this all too brief consideration of colonial bounties, that in 1769 when Parliament re-established the previously discontinued bounties in Florida, distribution of them was left to the Governor who wished particularly to foster not only the cultivation of indigo, cotton, dried figs and raisins, and the production of cochineal and safflower, but also the output of barilla. This substance is a crude form of sodium carbonate which was formerly much used in the manufacture of soap. Its interest for us lies in its being obtained from the ashes of burned marine plants. The latter, before introduction of the improved process of manufacturing soda from salt, were formerly cultivated for the purpose in Spain, Sicily, Sardinia, the Canary Islands and the Levant, and introduction of the industry into Florida was regarded as desirable.

Nineteenth Century Litigation

While bounties on plants have had some influence on American life, they have not played a very conspicuous part in litigation, with the exception, possibly, of sugar bounties, which are somewhat outside our field of consideration, for they were concerned primarily with a manufactured product and only indirectly with the sugarcane as a plant. More pertinent to our study are the bounties offered for the planting of trees and shrubs and for the providing of seed grain to farmers. Spatial limitations permit us on this occasion to review only three of these cases. Before considering them, however, it must be said that agricultural bounties in America are more or less matters of the past. Today they are regarded as unconstitutional, since they involve the expenditure of public funds, collected through public taxation, for the benefit of private enterprises. The development of this point of view and the present significance of it is one of the interesting aspects of bounty history.

* * *

The earliest case, so far as the author has been able to determine from records on appeal, occurred in 1869 in connection with a bounty on the production of silk.[3] It was in California and resulted from an attempt during the third quarter of the nineteenth century to develop a silk industry in that state, many years after the Colonies in the East had forsaken the same idea. The California effort, likewise, was unsuccessful, and after 1875 was almost forgotten, but in the years that the project was under way much publicity was given to the matter. To promote the incipient industry various means were employed and assistance from the state government was vigorously solicited. The endeavor, very naturally, involved the raising of silk worms, and for that purpose white mulberry trees were necessary. Finally, after sufficient pressure had been brought to bear on the state legislature, a bill was passed in 1866 which became "An Act for

[3] Attorney General v. State Board of Judges. 38 Cal. 291.

the Encouragement of Silk Culture in California." This bill, among other features, sought to encourage the planting of mulberry trees by granting a bounty of $250 "for each plantation of five thousand mulberry trees of the age of two years." Two years later, after considerable experimentation and after "the press of the State had teemed with articles and communications giving information upon the subject," this provision was modified by the Act of 1868 to include premiums of $125 for plantations of 2,500 trees, and of $62.50 for those of 1,250 trees. A so-called State Board of Judges was empowered to make the awards, and it was in the exercise of their duties and their interpretation of the above quoted part from the statute, that the law was brought into the courts and certain absurdities in it revealed.

The original law of 1866 had made provision for fractions, and on this score, as well as on the interpretation that the law of 1868 granted bounties for *each* 1,250, 2,500 or 5,000 trees in a plantation, the Board of Judges, on one occasion, made the following seven awards to as many claimants, apparently regardless of the actual number of trees involved in each case:

$6,125	on	24½	plantations
$3,875	on	15½	plantations
$3,000	on	12	plantations
$1,000	on	4	plantations
$ 500	on	2	plantations
$ 375	on	1½	plantations
$ 250	on	1	plantation

Before these awards were carried out, however, the Attorney General of the State was in some way prevailed upon to contest the rulings of the board, and so we find him in court pleading on behalf of the People of the State that their money was being misappropriated by the board's drawing imaginary lines through large plantations, dividing them into units of 1,250, 2,500 and 5,000 trees, as well as half plantations, and then giving bounties on each such unit. He asserted that the claimant of 24½ plantations, for instance, really had only two; the claimant of 15½ plantations, only one; and the claimant of 12 plantations, also only one. He concluded his objections by saying that "The Board, I think, forgot that the State, in offering these premiums, intended them as a healthful *aid* to the enterprise, and never intended to make it a speculation to be paid for by the State in the matter of raising the mulberry tree; it was an encouragement intended, and not a matter of lucre. . . ."

The question which thus devolved upon the Supreme Court was "whether a parcel of land which is planted in mulberry trees can be subdivided by imaginary lines so that each subdivision shall constitute a *plantation*, within the meaning of the Act of 1866."

After due consideration of this question and much discussion of terminology in the parlance of farms, orchards and plantations, the Court

maintained that any interpretation of the law to grant bounties according to multiples of numbers of trees planted was absurd, wholly apart from the fact that the revised Act of 1868 had not made any provision for fractions. Were this practice to have been condoned, the court stated, a quarter section of land planted in nursery fashion, with trees a foot and a half apart and in rows three feet apart, might have resulted in a claim of 309½ plantations and premiums amounting to $77,375! Such close planting would not, of course, have been suitable for silk-culture purposes, but even were trees to have been planted 3 by 6 feet apart, an acre would have supported 72½ plantations and been a basis for claiming $19,375 in bounties! The absurdity of the situation is very apparent from these figures, and had the practice been permitted to continue, the raising of mulberry trees would most certainly have been a profitable enterprise, and the growth of the industry, without ever actually producing silk, might have wrecked the state treasury.

So while the court recognized that a man might have had more than one plantation and have been entitled to a bounty on each, provided they were entirely separate and distinct, he could not subdivide any one of them on the basis of the number of trees and collect on the individual parts. It was never the intent of the law, the Court held, to make the raising of mulberry trees lucrative by way of State funds, allocated on any such basis; the bounties had been offered merely to encourage the cultivation of mulberry trees in general. The awards of the board were accordingly ordered changed in harmony with this viewpoint and with the stated interpretation of the law. It must be noted, however, that the constitutionality of the statute was not attacked, nor the general principle of granting bounties criticized. It was only the method of distributing the bounties that was ordered revised.

* * *

Among the cases which considered the matter of constitutionality we may well give heed to one of 1891 in Missouri.[4] Twenty years earlier, in 1870, a statute was enacted for the purpose of checking the rapid destruction of forest trees which was going on at that time in the state and to assure a lumber supply for the future. It was entitled "An Act to Encourage the Growth of Forest Trees," and it sought to accomplish its purpose by granting subsidies in connection with planting operations. It was a verbatim copy of a Kansas law passed in 1867, and as revised in 1875 part of it read as follows:

"Every person planting one acre or more of prairie land within ten years after the passage of this act with any kind of forest trees except black locust, and successfully growing and cultivating the same for three years, and every person planting, protecting, and cultivating for three years one-quarter of a mile or more of forest trees upon his own land, to be set not more than one rod apart, shall be entitled to receive for fifteen years, com-

[4] Deal v. Mississippi County. 107 Mo. 464, 18 S.W. 24, 14 L.R.A. 622.

> mencing three years after said grove or line has been planted, an annual bounty of two dollars per acre for each acre so planted, and two dollars for each quarter of mile so planted, to be paid by the county. Said bounty shall not be paid any longer than said grove or line of trees is kept alive and in growing condition."

We can readily imagine the incentive which this statute provided, with its promise to pay each year for 15 years two dollars per acre or per quarter mile of planting. In that period of time an original investment in planting stock could thus have been retrieved several times over if a planter raised his material himself from seed; and to have purchased seedlings, if forest tree nurseries were then and there in business, probably would not have cost more than a very few dollars per hundred.

The boom was on, and among those who took advantage of the offering was one Henry J. Deal. In 1882 he set out 202 acres of prairie land with catalpa trees, and when the trees were sufficiently established to justify payment of the bounty on them, Deal put in his claim. In 1885 the county, accordingly, paid him $404, and again the following year it awarded the same amount. But when Deal presented his claim for the third instalment in 1887, the authorities refused to pay it.

One wonders whether the commission which had already granted Deal two bounties had suddenly become aware of a significant legal point, or whether the personnel and with it the viewpoint of the commission had changed during the year, for now the statute under which the bounty was claimed was found to be in conflict with the State Constitution. In 1875, before Deal had done any planting, a new constitution had been adopted with the provision that no public funds were to be given to any private enterprise. This restriction was gradually entering more and more into legal thinking during the century, and Deal's operations certainly were of a strictly private nature. Had he not, however, made claim under the bounty law which antedated the constitution by many years, and did he not therefore have a legal claim to the bounties? No, said the court to which Deal brought his claim, for the new constitution had anticipated such a situation by specifically stating that any previously enacted law which might conflict with it was no longer effective. So after having collected two bounties on previous occasions in violation of the constitution, Deal was restrained from receiving any further benefits at the expense of the county, and when he appealed to the Supreme Court of the State, this judgment of the matter was upheld.

Deal's contention had been:

> "The law is constitutional. . . . Bounties are given to promote the public good, and the intention of the legislature should not be defeated by the courts. The public is benefited, as well as the individual recipient of the bounty. We pay a bounty for wolf scalps; this is source of profit to the individuals killing the wolves, and a source of security to the other citizens of the state. So with the cultivation of forest trees. The recipient of the bounty is benefited one way, and the public is benefited by the safety of a valuable commodity, and the encouragement of other parties to protect and cultivate groves of trees. . . ."

But the Supreme Court thought otherwise:

> "It is not always easy to determine what a public purpose is, but here no difficulty arises. The land on which plaintiff set out the catalpa trees belonged to him, was his private property, and there is nothing in the statute to prevent him from collecting the bounty from the county, and then cutting the trees down and selling them for his private gain; and to take money collected by taxation from the people for such a purpose cannot be tolerated for a moment without a surrender of all property to the power of confiscation for private uses."

In conclusion, the court also commented as follows, and therein we detect the basic error in the statute:

> "The legislature of Missouri had no power to authorize county courts to raise money by taxation, to be appropriated to the planting of trees upon private property for private gain, no right to the trees or the use or control of the trees being reserved to the public."

* * *

Colorado was the next State in which bounty laws concerning plants were declared unconstitutional,[5] but not for the same reason as in the Missouri case. In 1881 the Colorado legislature adopted two such laws, each of which, as is always true of bounty laws, was designed to correct certain local conditions. One of them was entitled "An Act to Encourage the Planting of Trees upon the Roadsides, and along the Line of Irrigating Canals, and upon Lands under Irrigation." It paid a premium of two dollars per 100 trees so planted and growing after three years, to be awarded each year for seven years. As further inducement, it also provided that the planting of trees as specified would not increase the value of the land for assessment and taxation purposes. This provision was incorporated in the law in recognition of one of the most significant deterrants of private afforestation, namely, increased taxes many years before there can possibly be increased profits from land as a result of forest tree planting.

The other bounty was designed to assist in the eradication of certain weeds, particularly *Astragalus mollissimus* and *Oxytropis Lambertii*, which are poisonous to cattle and known as loco-weeds. This so-called "Loco-weed Law" provided "that any person who shall dig up any loco or poisonous weed in accordance with the provisions of the act 'shall receive a premium of 1½ cents per pound for each pound of such weed dug up.'"

After these laws had been on the books about ten years, during which period payments had undoubtedly been made on many occasions, a certain "Institute for the Education of the Mute and Blind" made a claim for bounties. Their claim apparently was rejected by the authorities, for we find the matter in the records of the Supreme Court where it undoubtedly was brought by the institute in a last effort to make collection. This court, too, refused to grant the bounties, declaring the statutes under which

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[5] Institute for the Education of the Mute and Blind v. Henderson. 18 Colo. 98, 31 P 714, 18 L.R.A. 398.

they were demanded contrary to the State Constitution and therefore unenforceable. This declaration of unconstitutionality was not based, however, on the broad principle of private use of public funds, which militated against the Missouri claims, but on the technicality that, according to the statutes, the premiums paid under them by county treasurers were to be credited to the counties as payments of State taxes. This could not legally be done and the laws in their entirety therefore were declared inoperative.

* * *

In conclusion we may note the significant decision [6] of the United States Supreme Court on January 6, 1936, when it declared the Federal Agricultural Adjustment Act of May 12, 1933, as contrary to the Federal Constitution. This act provided for direct payments from public funds to farmers, in connection with regulation by government authority of production and marketing of agricultural products. It proposed to levy "taxes on processing of agricultural products to provide funds for direct rental and benefit payments to farmers for taking land out of productive use and reducing live stock production." This act involved what is known as the "adjustment" principle and it was "based on the theory that the purchasing power of the agricultural class, lowered by low prices for its products as compared with those of other industries, should, for the promotion of agriculture, in view of its importance to the public welfare, be raised to a parity with that of other classes by government assistance." [7] This attempt to regulate and control agricultural production, the Supreme Court held, unconstitutionally invaded the reserved right of States, and the act, accordingly, was declared invalid.

Thus we see in final observation that evolution in jurisprudence has almost wholly eliminated from man's relation with plants, at least in our country, one of the factors which contributed to the development of that intimate relation in days gone by.

Notes, News, and Comment

Fellowship Fund. A further contribution to the Alexander P. Anderson and Lydia Anderson Student Fellowship and Research Fund was received by the New York Botanical Garden last month when Dr. Anderson, of Tower View Laboratory, Red Wing, Minn., sent a check for $2,500. In 1928, Dr. Anderson made a gift of $10,000 to the Garden, income from which was to be used for student fellowships and research.

Herbarium Gift. The herbarium of specimens of the local flora of the vicinity of New York, which was built up by Mr. George T. Hastings while he was a teacher at Theodore Roosevelt High School in New York and an active leader of field trips for students and for members of the Torrey Botanical Club, has been presented to the New York Botanical Garden. Since his retirement a year and a half ago, Mr. Hastings has been living in California. In years past, he was a frequent lecturer and guide at the

[6] United States v. Butler. 80 L.ed. (Adv. 287), 56 S.Ct. 312, 102 A.L.R. 914.
[7] 2 Am. Jur., Agr. 25.

Botanical Garden and, until September 1939, he was editor of *Torreya*.

Annual Meeting. Officers and board members whose terms were expiring were all re elected at the annual meeting of the New York Botanical Garden January 16 in the office of President Joseph R. Swan. The members of the Board of Managers whose terms are now extended to January 1945 are Arthur M. Anderson, Pierre Jay, Clarence McK. Lewis, E. D. Merrill, H. de la Montagne, Francis E. Powell, Jr., and William J. Robbins.

Seven new members were elected to the Corporation of the New York Botanical Garden, four of whom, Mrs. William Redmond Cross, Mrs. John Ross Delafield, Mrs. Walter Douglas, and Mrs. Alfred G. Kay, were elected to the Advisory Council late in the year, while the remaining three, Mrs. Percy H. Williams, Mrs. Barent Lefferts, and Mrs. Guthrie Shaw, were elected the day of the annual meeting to the Advisory Council.

The following committees were appointed for 1942:

Executive Committee. Henry de Forest Baldwin, Henry F. du Pont, Pierre Jay, Clarence McK. Lewis, Marcus M. Rhoades, William J. Robbins, and the President (Joseph R. Swan) and the Treasurer (Arthur M. Anderson), ex-officio. *Finance committee:* Pierre Jay, H. Hobart Porter, and the President and Treasurer, ex officio. *Scientific committee* Clarence McK. Lewis, chairman, E. D Merrill, Franklin F. Hopper, and Herman A. Spoehr. *City Relations committee.* Henry de Forest Baldwin, chairman. *Pension committee.* Arthur M. Anderson, Pierre Jay, and James A. Dawson. *Committee on Development Plan:* William J. Robbins, chairman, Mrs. Harold I. Pratt, James A. Dawson, Henry F. du Pont, and the President, ex officio.

Conference. Members of the staff who attended the annual meeting of the American Association for the Advancement of Science, which took place the last week in December in Dallas, Texas, gave reports at the monthly conference of the scientific staff and registered students of the Garden on January 14.

Mrs. Charles H. Stout. On January 21, Mrs. Charles H. Stout, a member of the Corporation of the New York Botanical Garden, died at her home in Short Hills, N. J, after a two years' illness. For six years previously she had also been a member of the Advisory Council of the Botanical Garden.

Mrs. Stout had a life-long interest in plants and was active in horticultural work, having written and lectured extensively and served with numerous horticultural societies. One of her books was "The Amateurs' Book of the Dahlia." Daylilies were also among her paramount plant interests, and she was one of the first to receive some of the new seedling daylilies during the early years of their development at the New York Botanical Garden.

Torrey Club. At the meeting of the Torrey Botanical Club at the Botanical Garden the afternoon of January 21, Dr. Leila V. Barton of the Boyce Thompson Institute for Plant Research spoke on "Some Special Problems in Seed Dormancy," using the seeds of lily-of-the-valley as examples. Tea was served at the close of the meeting to the 36 members present.

Artists. Forty students of the New York School of Fine and Applied Art spent two days in the Main Conservatories the middle of January to sketch tropical plants for use as backgrounds and designs.

Librarians. The library was visited on January 7 by students from the School of Library Service at Columbia University. Elizabeth C Hall spoke to the group on "Work in a Special Library."

Park Association. Dr. William J. Robbins has been reappointed by the President of the Park Association of New York City to serve as a member of the Horticultural Committee during 1942.

Lecture Trip. During a trip to Texas the middle of January, Dr. A. B. Stout gave an invitation lecture on "The New Daylilies" in the program of a Garden Conference January 13 and 14 in Denton, under the sponsorship of the Texas Garden Clubs, Inc., and the Texas State College for Women. He also showed the Garden's motion picture in kodachrome. On his return, he spent two days at the Missouri Botanical Garden and showed the motion picture there to members of the staff and the gardeners. The evening of January 16, he spoke on daylilies to the St. Louis Garden Club. Both at St. Louis and at Denton, he displayed the 30 hand-colored plates of *Hemerocallis* which have been prepared at the New York Botanical Garden for illustration of a folio monograph of this genus.

Visitors. Dr. Herman A. Spoehr of the Carnegie Institution at Stanford University and Dr. Charles B. Lipman of the University of California visited the Botanical Garden Dec. 15.

Dr. G. W. Beadle of Stanford University came to the Garden Dec. 17 to confer with Dr. Robbins and Dr. Dodge on vitamin-like growth substances and the bread-mold fungus *Neurospora.*

Dr. Carl C. Lindegren of the University of Southern California, who is on leave to work at Washington University, St. Louis, on the genetics of yeasts on a fellowship sponsored by the Anheuser-Busch Co., spent several days at the Garden early in January and consulted with Dr. Dodge on the genetics of fungi.

Dr. L. R. Parodi from Buenos Aires, Argentina, spent the latter part of November at the Garden, during an extended visit to eastern North America.

Dr. G. H. H. Tate, Assistant Curator of South American Mammals at the American Museum of Natural History, worked at the Garden for about six weeks toward the end of the year identifying plants that form the background features of the exhibits in the African hall at the Museum.

Other winter visitors at the Garden have included:

David R. Sumstine, Carnegie Museum, Pittsburgh; R. T. Clausen, William T. Winne, Eugene W Dehner, and Antoinette Mielle, Cornell University; Donald P. Limber, U S. Bureau of Entomology and Plant Quarantine.

Ricardo Fenschietto, Buenos Aires, E. D. Merrill, Arnold Arboretum; Louis M. Preuss, Lederle Laboratories; Samuel Grober, University of Maryland; William C. Steere, University of Michigan

Anselm J. Llewellyn, St. Benedict's Abbey, Atchison, Kansas; Annette M. Hervey, Smith College; Arnold Kornfeld, Iowa State College; Andrea Caccava and Daniel Bengas, Pennsylvania State Forest School; N. G. Froomken, University of Wyoming; Margaret Opperman, Syracuse University

Selman A Waksman, M. A. Johnson, and Ben Blackburn, Rutgers University; Louie Loug, Cairo, Egypt; William Seifriz, Philadelphia, Reid Moran, Ithaca, N. Y.

F. R. Fosberg, C. H. Muller, Jason R. Swallen, and Rogers McVaugh, U.S.D.A., and E. P. Killip and Egbert H. Walker, Smithsonian Institute, Washington, D C.

Robert P. Mull, Fordham University; B. A. Feldman, U.S.D.A.; F. H Pough, American Museum of Natural History, Harold Arrowsmith, Johns Hopkins.

Leonard Kline, Montreal Botanical Garden; Stephen G Cutting, Lancaster, Pa, and Bernard J. Cassidy, U. S. Army, all former student gardeners; and G. G. Nearing, Wanda K. Farr, Mrs Francis King, Ruth Cross, Helene Carter, and Michael Veres

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

With Camera and Microscope

PHOTOMICROGRAPHY. R. M Allen. 369 pages, 175 illustrations + 50 full-page plates of photomicrographs. D Van Nostrand Co., New York, 1942. $5.50.

The use of the microscope as an instrument of observation has long been supplemented by the use of the camera for preserving a record of such observations. But those interested have had to look abroad for comprehensive textbooks that would guide them in the making of photomicrographs. Now has appeared an American work that contains a lifetime of experience in this specialized field. It is based on methods developed by the author with equipment and materials that have been available in this country and that are in use in our laboratories.

In this comprehensive text will be found the information needed both by the technician who is required to turn to photography for the first time and by his more advanced associate who has had considerable experience in photomicrography. The selective arrangement of the work enables the photomicrographer to turn to the chapters dealing most directly with the problem at hand. The discussion by the author of his own methods should prove invaluable for it was by these methods that the extraordinary

series of photomicrographs in the final section of the book were produced.

JOSEPH F. BURKE.

A New Botany Text

FUNDAMENTALS OF PLANT SCIENCE. M. Ellen O'Hanlon. 488 pages, many illustrations, glossary and index. F. S. Crofts & Co., New York, 1941.

"Fundamentals of Plant Science" should make a very satisfactory text for a course in General Botany. The abundant material it contains is well selected and arranged in orderly fashion. It is evidently the work of an experienced teacher and should prove to be a real teaching aid. The material is up to date as, for example, the inclusion of the aberrant embryo sac development in *Lilium*. The illustrations are plentiful and well chosen, but in many cases have been too greatly reduced in size. As a cytologist the reviewer would have preferred a diagram of mitosis which did not suggest the occurrence of a continuous spireme.

C. A. BERGER, S. J.,
Fordham University.

A Nurseryman's Life in the 1830's

THE DIARY OF MICHAEL FLOY JR., Bowery Village, 1833-1937. Edited by R. A. E Brooks. 269 pages. Yale University Press, New Haven, 1941. $5

"It has been reported that the young lady did not put the 'junior' to my name in her letters, and that father had the pleasure of reading them all. All these do not trouble me half so much as did the pain in my tooth last night." This is but one small gem of the bubbling humor to be found in "The Diary of Michael Floy Jr."

This book is a charming human manuscript of the early nineteenth century in Bowery Village where the young Puritan nurseryman frequently "went to Harlaem and hoed between the peach trees." There is humor, pathos, gardening, mathematics and religion packed into the four short years of this daily diary.

The Diary of Michael Floy Jr. is a valuable and enduring book describing American life of a period for which few printed records exist.

LAZELLA SCHWARTEN.

How It Is Made

THE CHEMICAL FORMULARY. Vol. 5. H. Bennett, Editor-in-Chief. 676 pages, indexed. Chemical Publishing Company, Brooklyn, 1941. $6.

This volume gives formulae for making products that range from vanishing cream to kippered herring. The formulae are taken from patents, various publications and unpublished material from many sources. Some of the subjects covered are: adhesives, cosmetics, foods and beverages, paints, photography, plastics, soaps, textiles, and farm and garden specialties. These books are useful to anyone, including the botanist, who is interested in the practices of a particular industry or who needs specific chemical information.

F. W KAVANAGH.

Biological Dyes

STAIN TECHNIQUE. W. H. Emig. 75 pages, indexed Science Press Printing Co., Lancaster, Pa., 1941. $1

"Stain Technique" is a small volume of 75 pages which deals with the chemical and physical properties of 188 biological stains. The author also discusses the sources of the various stains, their general uses and the methods for selecting and combining them. Too little information is given for the specific uses of these stains. For the experienced technician this book contains data which may be very useful but for the beginner who is more familiar with plants and animals than with the names of dyes it would seem that the index should include a list of the objects to be stained in addition to the names of dyes.

CLYDE CHANDLER.

Student's Aid

BIOLOGICAL TERMS. A L. Melander. 157 pages, biological vocabulary. Department of Biology, The College of the City of New York. Second edition, 1940. $1.

A helpful and stimulating book, full of wisdom and sound advice regarding the words used by biologists. It was originally mimeographed for biology students at the College of the City of New York, but now is fortunately made available in book form.

CAROL H. WOODWARD.

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Pkwy., or, coming from Westchester, turn w

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner in plant identification. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 figures, covering algae, fungi, mosses, ferns, flowering plants. 1918. $3.50

A Text-Book of General Lichenology, by Albert Schneider. 230 pages. 76 plates. 1897. $2.50.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50; unbound $15.50.

Keys to the North American Species of Carex by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora.* $1.25.

Hardy Ferns and Their Culture. Edited by Carol H. Woodward. 40 pages, illustrated; bound in paper. 1940 25 cents.

Plants of the Holy Scriptures by Eleanor King, illustrated, and accompanied by a list of Plants of the Bible with quotations, in the March 1941 Journal. 15 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward. 28 pages, illustrated with photographs and drawings; bound with paper. 1941. 25 cents

An Herbal. First published by Richard Banckes in London. 1525 Edited and transcribed into modern English with an introduction by Sanford V. Larkey, M.D., and Thomas Pyles. 200 pages, including facsimile of original. Prepared by Scholars' Facsimiles and Reprints 1941. Price to members of the Garden, $2.50; to others, $3.50.

Periodicals

Addisonia, annually, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Now in its twenty-first volume. Subscription price, $10 a volume (four years). Not offered in exchange. Free to members of the Garden.

Journal of The New York Botanical Garden, monthly, containing news, book reviews, and non-technical articles on botany and horticulture. Subscription, $1 a year; single copies 15 cents. Free to members of the Garden. Now in its 43rd volume.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $7 a year; single copies $1.25 each. Now in its thirty-fourth volume. Twenty-four Year Index volume $3.

Brittonia. A series of botanical papers. Subscription price, $5 a volume. Now in its fourth volume.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. Planned to be completed in 34 volumes, each to consist of four or more parts, 90 parts now issued. Not offered in exchange. Prices of the separate parts on request.

Contributions from The New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each, $5 a volume. In the 14th volume.

Memoirs of The New York Botanical Garden. A collection of scientific papers. Prices to members of the Garden: Vols. 1-6, $1.50 each; to others, $3. Vol. 7, $2 50 to members, to others, $5. *Contents:* Vol. 1, PER AXEL RYDBERG, An Annotated Catalogue of the Flora of Montana and the Yellowstone Park. Vol 2, D T. MACDOUGAL, The Influence of Light and Darkness upon Growth and Development Vol. 3, ARTHUR HOLLICK and E C. JEFFREY, Studies of Cretaceous Coniferous Remains from Kreischerville, N. Y. Vol. 4, C. STUART GAGER, Effects of the Rays of Radium on Plants. Vol. 5, NORMAN TAYLOR, Flora of the Vicinity of New York Vol. 6, Twentieth Anniversary of The New York Botanical Garden. Vol. 7, N. L. GARDNER, New Myxophyceae from Porto Rico; A. B. STOUT, The Flower Behavior of Avocados; H. H. RUSBY, Plants Collected in the Amazon Valley; ARTHUR HOLLICK, The Flora of the Saint Eugene Silts.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

USABLE PLANTS

THERE was a time—before the oceans were crossed by sailing vessels—when each great land-mass had only those food plants that grew there naturally. But for the last four centuries the plants of the Americas (corn, potatoes, tomatoes, and others) have been known and cultivated in Europe and Asia, while the rice and wheat, the cabbages, beets, and turnips of Eurasia have been grown and eaten in the western hemisphere.

But now there comes a time when each continent is again restricted, not only in its sources of food, but also in the plants that it uses for spices, flavorings, medicines, perfumes and cosmetics, as well as a great number of essential plant products, among them the rubber which goes into tires and the coconut which contributes to nitro-glycerine.

Instead of importing their products, as formerly, North America can learn to raise many plants from other continents. Many green things from the wild, heretofore unnoticed, can be brought into the economic sphere. Much new information is needed about both cultivated and native plants and their possibilities.

During March and April the New York Botanical Garden in several ways will promote a practical knowledge about usable plants. This month, at the International Flower Show, the Garden is staging an exhibit of more than 100 of the plants that were used for food and medicine by the Indians of North America Immediately after Easter there will be a two-day conference organized by the Botanical Garden to tell the story of the major contributions of each continent toward providing useful plants to the rest of the world, and to present the problem America has to face in furnishing its own supplies of these plants or locating satisfactory substitutes

Every person who visits the Garden's exhibit at the International Flower Show (March 16-21) or who attends the Herb Conference (April 7 and 8) will be impressed by the practical lessons in this exhibit and program.

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Food Plants Of The Indians

Vegetables, Grains, Fruits, Seasonings Gleaned from the Wild by the North American Natives

By Marion A. and G. L. Wittrock

WERE we in the woods or in the open country miles and miles from civilization, could we exist for a week without our customary food, or live for a year without seeds and the means for cultivating plants? Stranded under these circumstances, would we necessarily starve? Questions of this nature have often been asked by members of groups tramping over the country. In some instances hikers have actually been in a situation when a bit of knowledge of our native plant life and its possibilities would have prevented uncomfortable moments.

Let us go into the woods or open country and, observing what could be used for food, note our possible chance of existence.

We know that the North American Indians were dependent to a large extent on the plants that could be gathered from the wild, for while they sometimes raised corn, beans, pumpkins, squashes and sunflowers,* these did not always provide enough or sufficiently varied food, and of course

* When Columbus landed in America, the Indians in what is now the United States were cultivating the five major varieties of corn classed as flint, flour, dent, sweet, and pop. They were careful selectors of seed for all of their crops. Omaha tribes had as many as 48 varieties of pumpkins and squashes, and they learned early that varieties hybridized, sometimes ruining a crop if specially desired strains were planted too close together. Indian plant culture, however, was by no means on the high-production basis we now pursue in agriculture. There was no plowing or cultivation, no tilling of the soil. The Indian cleared a small plot and planted his kernels of corn in hills. Between these hills he sowed seeds of the sunflower, pumpkin, squash, and bean, the sunflower, of which the seeds were eaten, serving as protection for the growing corn and as a screen against the ravaging crows.

The corn story is the story of the American Indian. Besides more than 200 different recipes, there are records of the use of corn in medicines, beverages, dyes, ceremonies, and the arts. The cultivation of corn was an indicator of the state of cultural progress of a tribe.

no crops at all were attempted by the nomadic tribes. So the Indian found many wild plants to satisfy his palate, and those same plants are still growing in North American woods and fields.

Could we exist on these native plants? Yes, if we are not too fastidious and will accept what could be eaten. Of the 3,500 different species known to have been used by the Indians in America either for foods, beverages, fibers, medicines, dyes or utensils, nearly half were used for food.

A number of trees and shrubs provided nuts; many herbaceous plants gave greens and other types of vegetables; edible fruits came from innumerable plant sources; and many bulbs and tubers which are passed unnoticed today provided tasty vegetables, seasonings, or nourishing ground meal. In the absence of wheat, the Indians used the seed of many other grass plants for flour.

Nuts for Nourishment

But perhaps the most important native food plant of the Indian was the oak. Meal made of parched acorns that have been leeched with water to remove the injurious tannin has a delicious flavor and is nutritious. Indians long ago discovered the value of acorn meal, and they learned early how to remove the tannin by placing ground acorns in a fine-meshed basket in a stream where the water could trickle through continuously. After nine or ten days, the leeched meal would become pink in color and sweet in taste. When made into "pancakes" and fried in animal grease or vegetable oil, it provided a tasty and wholesome dish.

The trees with the sweetest acorns are the California live oak, *Quercus agrifolia,* and the basket or cow oak, *Q. Michauxii,* of the Atlantic States, but any acorn may be used for food if the tannin is removed.

Indians ate the nuts of more than 40 other species of trees and shrubs, as well as the nut-like seed of the water chinkapin, or American lotus, *Nelumbium luteum.* They roasted the nuts, extracted oil by crushing the meat, boiling and cooling it, and skimming the oil off the top of the water, or ground them into meal for soups, mush, even puddings—the last being made from the Indian nut, or piñon, *Pinus edulis.* Of course the 43 species known do not occur within the boundary of any one woodland. Our eastern woods that we have entered with a hope for food would reward us with the American beech, *Fagus grandifolia;* several species of the hickory, *Carya;* the black walnut, *Juglans nigra,* and the butternut, *J. cinerea.* And we must not forget the hazelnuts, *Corylus americana* and *C. cornuta.* Unfortunately, these are all seasonal foods which may not be ripe when we are wandering in the woods, say in the spring or summer. We must, however, keep this form of food in mind to store for winter use, as did the Indians. Had we the Indian knowledge of the woodland and were we on the alert, in the springtime we could possibly find caches of beechnuts that had been stored by the deer mouse. This little creature usually

The yellow-flowered American lotus or water chinkapin furnished food with its nut-like seeds, also its tuberous roots.

gathers from 4 to 8 quarts of the small nut and it might have failed to use its winter supply. Indian women would find these caches and rob the storehouse, but would always leave a handful of corn in return. Would we be as appreciative?

Hundreds of Kinds of Fruits

Fruits are our next possible source of food. It is surprising to observe that the Indians enjoyed fresh berries and berry-like fruits from at least 278 species of plants that occur in the United States. Besides eating berries raw, they boiled, baked, or dried them, crushed them for cakes and mush, or mixed the fruit with seed meal for flavor. And many berries were used for beverages, seasoning, spices, and in medicine. More than 50 kinds were dried for winter use, one, the service-berry, *Amelanchier canadensis,* being pressed into loaves weighing from 10 to 15 pounds. It

was described by Lewis of the Lewis and Clarke Expedition as most delicious when served as a winter food, eaten raw or broken into soups.

One of our common blueberries, *Vaccinium pensylvanicum,* was dried in the sun as we dry raisins or currants for winter use. Some tribes ate the dried berries with dried sweet corn sweetened with maple sugar. This recipe was the famous "Menominee dish." The Flambeau Ojibwe cooked the dried berries with wild rice or venison. They also made a delicious sweet bread of the dried fruit. But not all of the berries eaten were so palatable. We challenge anyone to claim that he enjoys the woody, bitter, coarse berries of the carrion-flower, *Smilax herbacca,* yet Indians ate them raw or cooked, besides using them in medicine.

Naturally, the native blackberries, raspberries, currants, gooseberries and strawberries were relished by the Indians, but let us turn to fruits not popularly classed as berries.

We find that the Indians throughout the United States picked fruit, in addition to berries, from 212 species of plants. These fruits were eaten raw, boiled, made into meal for bread, baked into cakes, dried for winter use, candied, used for flavors, cooked as a gruel or mush, parched, roasted, and also cooked and served as a sauce. We all enjoy fruits and consider them necessary to health, but to the Indians they were sometimes even more important. The fruits of many cactus species will serve as an illus tration. When the prickly pear or tuna ripened, southwestern tribes would gather and celebrate for weeks before the actual harvest, for this period began their calendar year. After proper rituals the new year would begin; then the Indians would work feverishly harvesting the fruit.

In our section, here in the East, we may gather wild plums, cherries, hawthorns, persimmons and many other fruits.

Fruit pods, especially of members of the Pea family, may also be used as food. Our records show that the pods of 14 species were eaten raw, while the fruit pods of more than 15 species were cooked as a vegetable or potherb. Perhaps the most interesting of this group is the mesquite, *Prosopis glandulosa,* which grows in the Southwest. This yellow fruit consists of a bean-like pod 6 to 8 inches long containing numerous hard dark seeds between which there is a considerable quantity of yellow, farinaceous substance which is sweet and agreeable to the taste. Indians of the Mojave Desert section pounded this yellow pulp in their crude mortars after removing the seeds and husks, then made it into a kind of cake that resembled cornmeal in appearance and taste.

The discarded seeds were ground into a meal which was baked into a kind of bread or prepared as a mush. The pod of the screw-bean, *Prosopis pubescens,* was used in a similar way.

Flowers Fried and Boiled

Of the many flowers found in nature, how many do we use as food? Those that are grown in vegetable gardens today are all of Eurasian

origin—cauliflower, broccoli, and artichoke (of which we eat the involucral bracts of the flower in the bud stage). The Indians, however, ate raw the flowers of 24 species of wild plants; boiled the flowers of many others; fried the flowers of the beautiful redbud, *Cercis canadensis;* boiled the buds of the common milkweed, *Asclepias syriaca,* and of Spanish bayonet, *Yucca baccata;* and cooked as potherbs the inflorescence of 15 other species in the bud stage.

Leaves for Greens and Potherbs

This brings up the question of greens, or potherbs made of leaves and shoots. The many plants used by the Indians make indeed an imposing list. It seems that anything green, tender, and not too fibrous was used. More than a dozen different kinds of leaves were eaten raw, others were used as relishes, the leaves of 59 species were boiled as we prepare spinach, and 14 kinds were boiled with meat. Species of clover, *Trifolium,* were foraged by California tribes. Indians were often observed in the fields eating the plants raw, though they did have a pouch of salt from which they would occasionally take a pinch to give a bit of flavor—and incidentally aid digestion.

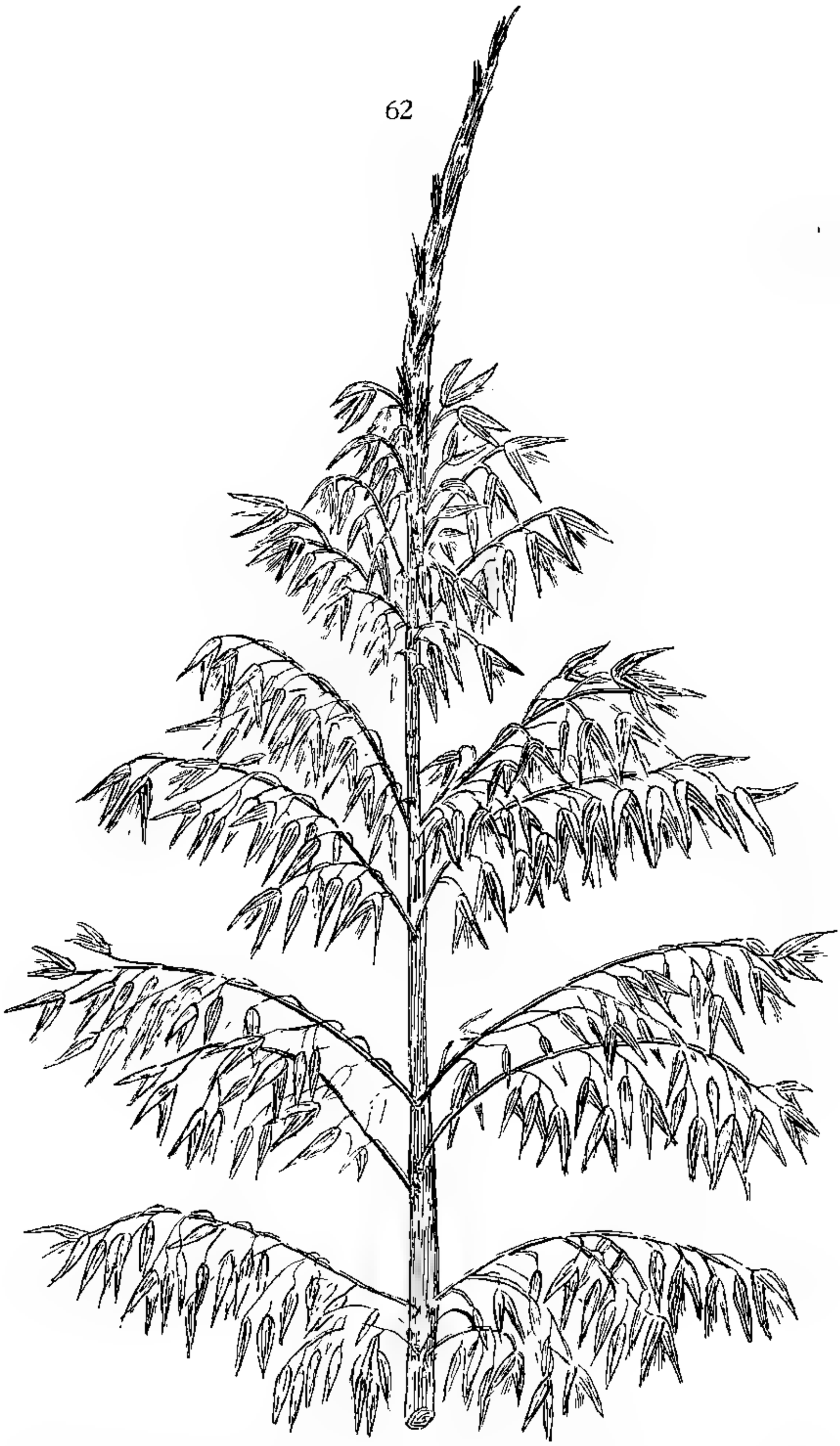
The common milkweed was gathered in early spring and boiled as a potherb, as were the young plants of the cow parsnip, *Heracleum lanatum,* which they were apparently better able to distinguish than the average white man can from the poisonous members of this family. The Indians boiled the whole plant of various species of *Oxalis;* the lovely plant of the marsh marigold, *Caltha palustris;* the pleasant, succulent stem and leaves of the western miner's lettuce, *Montia perfoliata,* and of scores of others, including the very young leaves and shoots of the pokeweed, *Phytolacca decandra,* a plant which becomes poisonous when it matures. We find not one section throughout the United States that failed to have at least a few plants for use as a potherb to the Indian.

Greens that were gathered from the wild, like those above, were seasonal foods, used when available to give added flavor to meats. Seeds, roots, and tubers were taken more seriously because this class of food could be stored for winter use.

Native Grains and Other Seed Foods

Besides that most important of seed plants, maize or Indian corn, which was cultivated, the Indians depended on the seeds of many wild plants for food.

We are so accustomed to the use of our Eurasian grain plants, such as wheat, barley, rye, millet, rice and oats, that we do not accept the possibility of other grass species that could be used as grains. Without question we are now cultivating the best grain plants that nature can offer, but there are many we could use were we patient enough to harvest them.



Wars were fought over wild rice fields in northern United States and Canada. The grains from the heads of Zizania aquatica (shown here approximately 1/4 natural size) were one of the most important Indian foods in the regions where they grew.

Either the grain of native grasses is too small, the hull or chaff too difficult to remove, or the harvest too small in return for the labor expended, to rouse an interest in this source of food.

Wild rice, *Zizania aquatica,* however, is now becoming a grain of the market. It was an important food of the Indians, particularly in the northern parts of the United States. This grass has many advantages over our cereals, particularly because it renews itself annually by seed. No planting is required, no cultivation, only harvesting, storing the seed, and, for the Indians, protecting the stand from other tribes. The Great Lakes Region was the seat of many tribal wars for possession of the rice fields. The grain was highly prized by the Indians, who called it in general "good berry," or "manomin," or "manoman," from which the Menominee tribe derives its name. Indians would gather the grain by canoe, pulling the reeds over into the boat to thresh the heads. Though it is a very laborious task, one man, it has been observed, could reap as much as 780 pounds in a season. Forty pounds a day was considered a good harvest. Returning to shore with their load of grain, the Indians would parch but not scorch the seed, then trample over the grain to thresh the hull, and finally winnow the seed in the air to remove the chaff. The parching process dried out excess moisture and destroyed insect eggs that might have been in the rice. Thus safe storage was assured.

Wild rice is restricted in its distribution, so it was known to only a limited number of tribes, but another grass that was used by the North American Indians is so cosmopolitan that it has been found growing wild throughout the temperate zones of the world, and on nearly every continent it has played an important part in the lives of primitive people. Civilization ignores the plant other than its possible use as a sand binder. We refer to the common reed grass or cane grass, *Phragmites communis,* which is familiar to all New Yorkers who cross the Hudson River into New Jersey, for acres of it are visible from automobile or train. Besides being useful for thatching, weaving, and making arrow shafts, this tall perennial grass is a source of food throughout the year. During the winter the rhizomes can be dug and boiled as potatoes; in the early spring the shoots that push up from the marsh land can be prepared as we cook asparagus; the partly unfolded leaves can be cooked as a pot herb; finally, the large panicle ot grain can be harvested for seed. The kernel is small and is coated with a dull red hull which is most difficult to remove, but the seed contains nutritious food materials rated between wheat and rice. The Indians did not remove the hull, but cooked the whole grain into a reddish gruel which was wholesome as a food, though not too appetizing in appearance.

Frequently the Indians ground together a mixture of seeds from several kinds of plants, and the Spanish word "pinole" has been adopted throughout the country as the name for this combination of seed food. Pinole was

either eaten raw, mixed with water and eaten uncooked, boiled into a gruel, or added to water in very small quantities to serve as a thirst-quencher. To the grasses were added seeds of certain members of the Goosefoot, Amaranth, Buckwheat, Loasa, Mint, and Composite families, the normal mixture consisting of three to five different kinds plus enough corn meal to give it body.

Seeds of many of our native plants could be used as food were we forced to ward off hunger or had we but the patience to gather them. We naturally would have to know the plants, but we would be fairly safe if we were to gather only the seeds of grasses. Many of them have delicious flavors that would make our bread and cakes the envy of a chef. The Indians boiled the seeds of 26 species as we do rice; of others they made meal from which they prepared delicious cakes usually sweetened with honey or maple sugar. They found ten kinds of plants that they could use as popcorn; and others for gruel or mush, for seasonings and flavors, for roasting or parching, and 90 kinds of which they made meal, even from some a fine flour. The imposing number of species used would certainly give us our daily bread, our necessary starch for food. While these records represent plants throughout the United States, we feel certain that a few of the species may be found in any one locality across the country. As we wander through the woods, its margins, along the streams, beside lakes, we could hardly keep from tramping over possible food.

Edible Roots and Other Underground Parts

Most of these seed-plants we would find in late summer or autumn, but if we are caught in the woods say in winter time, we still could survive because of the many roots, tubers, and bulbs that are edible and even palatable.

Bulbs and corms were highly relished by the Indians. We naturally think first of onions, and the Indians enjoyed all the native species, eating not only the bulb but the shoot. Chicago derives its name from the wild garlic, *Allium canadense,* a species of onion formerly common along the banks of the Chicago River, particularly where the center of the city, from Michigan Boulevard westward, now is located. The banks of the river were covered with this strong-smelling plant, and the Winnebago Indian would come from afar to gather the SHIKAKO'AK, the "wild weed" (also called "skunk weed") at SHIKAK'O, "the place where the skunk weed grows."

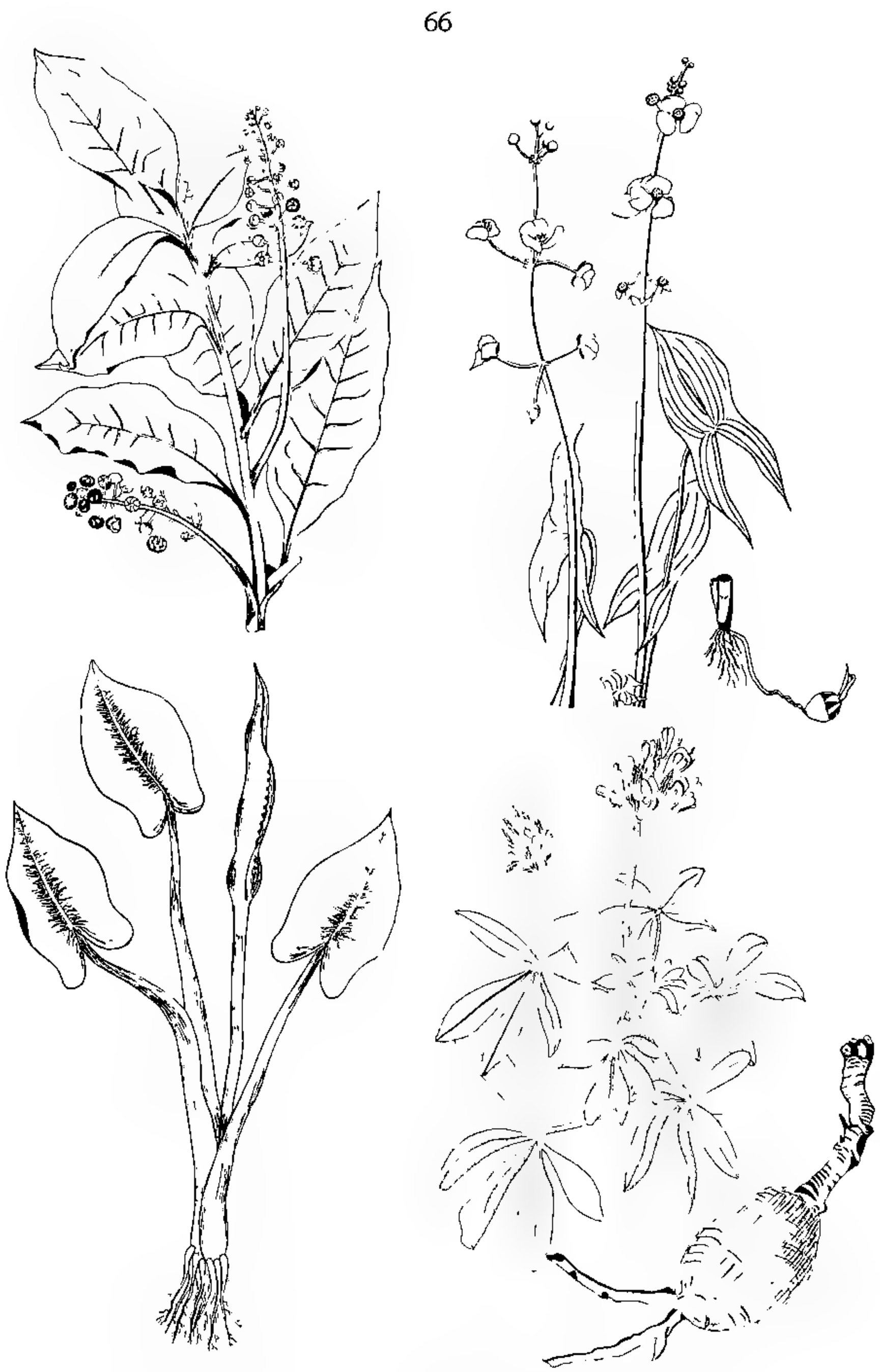
Of the bulbs we find that more than 35 species were eaten raw, 21 species baked or roasted, 19 species boiled; and many prepared as a meal for bread and cakes, or dried for winter use, served as relishes, used as seasoning, boiled for soups, and steamed.

Many of the bulbous plants are ornamental enough to be used in horticulture today. Who has not admired the beautiful mariposa lily, sego lily,

Known today only in horticulture (or as wild flowers to hunt in spring and early summer,) Brodiaea, Camassia, and Dodecatheon, or shooting star, were sought by the Indians for their edible underground parts.

and star tulip—all species of *Calochortus?* The butterfly mariposa, *Calochortus venustus,* was highly esteemed by the Indians for its sweet corms. Sego lily, *Calochortus Nuttallii,* the state flower of Utah, was a delicious food for them and also believed a common article of food among the first Mormons in Utah. The biscuit-root or camass, *Camassia esculenta,* has been considered an important article of diet among all western Indian tribes. Another western species, the California hyacinth or grassnut, *Brodiaea capitata,* is both beautiful as a flower and good as a food. And many other species of Brodiaea were used. Coming east we could use bulbs and corms of species of *Trillium;* of the spring-beauty, *Claytonia virginica;* the dog-tooth violet, *Erythronium americanum;* and many others.

The common jack-in-the-pulpit, *Arisaema triphyllum,* was considered an excellent food and was used so extensively by Indians in the New England states that it became known as the Indian turnip. We know the fiery taste of the corm if we bite into it, but once it is boiled thoroughly the needle-shaped calcium oxalate crystals are dissolved and the turnip becomes most palatable. We find this important plant employed more than thirty different ways by the Indians.



IMPORTANT PRIMITIVE FOOD PLANTS IN NORTH AMERICA

Upper left: Young shoots of pokeweed, or scoke, were cooked in spring. Upper right: The tubers of the arrowhead were widely used by Indian tribes. Lower left: The thick

Of even greater usefulness was another member of the same family, the Virginia tuckahoe or arrow-arum, *Peltandra virginica.* This species is found in shallow waters of the Atlantic states from Canada to Florida. The raw flesh of the compact, tuber-like cluster of roots is exceedingly acrid and poisonous, and the same fiery sensation is experienced biting into it as into the corm of the jack-in-the-pulpit. The Indians, however, discovered how to make this plant a valuable food by heating or roasting the underground portion by the following method: A deep pit was dug and lined with stones; a fire was built in the pit, and when the stones were hot, the embers were removed and the 5- to 6-pound clusters of roots were placed in the pit, covered with earth, and kept there for two days. In this way they would be "cured" of their unpleasant character and become good food when dried and ground into meal.

The Sioux Indians boiled the rhizomes of the attractive butterfly-weed of the roadsides, *Asclepias tuberosa,* and also cooked the young seed-pods with buffalo meat, while the Delaware tribe ate the shoots of this plant as we eat asparagus.

The cat-tails, *Typha latifolia* and *T. angustifolia,* were also important plants to the Indians, for the rhizomes can be dug at any time and prepared as a food. They consist of an almost solid core of starch, which was dried and ground into meal. Analysis shows that the flour contains about the same amount of protein as corn meal, but that it has less fat. It could be substituted for cornstarch in puddings.

A tuber of special interest is developed late in the fall at the end of the rhizome of the wappatoo or common arrowhead, *Sagittaria latifolia,* which grows in wet places from the Atlantic to the Pacific and Canada to Mexico. Lewis and Clarke reported the merits of this potato-like staple, and noted that it was used in commerce by Indians along the Columbia River in Oregon. An Indian woman would wade into the water waist deep, if necessary, and with her toes would loosen the tubers from the mud and break them away from the long slender rhizomes. They would rise to the surface, from where they were easily placed in her canoe. Roasted or boiled, this tuber becomes soft, palatable, and digestible.

The ground-nut, *Apios tuberosa,* can be used as a spring vegetable by simply gathering and cooking the young seedlings, and the pod, in late summer, contains a few peas that are wholesome. But the important part of the plant is the chain of swollen knobs that develop on the roots in the autumn, sometimes attaining the size of a pullet's egg by the time they are ready to eat after two or three years' growth.

An important root crop of the western American Indians was the famous bread-root upon which they partly subsisted in winter. Belonging

root-clusters of the arrow arum were made edible by the Indians by baking for two days in a deep pit. Lower right: The bread-root or prairie apple of the West furnished a major food for both Indians and whites in the early days.

to the Pea family and botanically called *Psoralea esculenta,* it has also been known as prairie apple, prairie potato, and pomme blanche. Roasted in hot ashes, these fleshy roots gave a nutritious food similar to yams. For winter use they were carefully dried, then stored in dry places in the huts. When wanted for food they were mashed between two stones, mixed with water, and baked into cakes over hot coals. Dug early in the spring they were eaten raw.

The other so-called bread-root, known also as racine blanche, cous, cous root, and biscuit-root, *Lomatium ambiguum,* of the Carrot family, was similarly important to the early inhabitants, explorers and pioneers in the West. When fresh it tastes like parsnips, to which it is related, but as it withers and dries it becomes brittle and very white and acquires a most agreeable mild flavor as of celery. It keeps well and is easily reduced to flour. Many other roots of the Umbelliferae have been used, but the presence of a few species of dangerously poisonous plants in this family makes it unwise even to suggest them.

Man-of-the-earth, wild jalap, man-root, or wild sweet potato, *Ipomoea pandurata,* a pinkish-flowered twin sister of the morning glory, was commonly used by the Indians from the Atlantic Coast to the Mississippi and even farther west. A vicious weed of farm lands today, it was once a valuable food, for the edible root sometimes weighs as much as 20 pounds. In the Southwest, the Indians found a few wild species of *Solanum,* notably *S. Jamesii* and *S. Fremontii,* close relatives of the true potato, *Solanum tuberosum,* from Peru.

Also in the West, the balsam-root or arrow-leaf, *Balsamorrhiza sagittata,* a member of the Thistle family, proved a useful plant to the Indians, for its agreeable-tasting roots were eaten either raw or cooked. The young stems were served raw as a salad, and the seeds were roasted and ground into a kind of flour.

One of the strangest of all the foods of the American Indians is a plant which is a curiosity in itself. Native in the Sonoran desert and adjacent sandy wastes to the north, it lives as a parasite on the roots of a shrub. Until its small flowers appear, the plant closely resembles a fungus, for above its entwining roots there is a long subterranean stem which widens into a succulent funnel-shaped cup out of which the flowers arise just at the surface of the sand. This succulent underground stem is the portion that is eaten. Travelers and prospectors have also been known to obtain a life-saving drink of fresh water from within the submerged cup. The plant was first seen by a white man during a railroad survey in 1854. It was described ten years later by John Torrey, the famous botanist, and named by him *Ammobroma sonorae,* meaning "sand food of the Sonora." The Indians, and later the whites of that region, ate the stems either raw or cooked. When boiled they have a taste like sweet potatoes. The plant was also ground with mesquite beans to make a kind of pinole.

How many barks of trees, shrubs, or roots do we use as a food? None today as a food, and only a few (such as bark of cinnamon, sassafras, and cinchona) as spice or medicine. But the Indians used the bark of over 20 species as food. One major group of Indians gained their tribal name, Algonquin, which means "they eat trees," because bark was a part of their diet. Species of willow, poplar, pine and cedar were used. The cambium layer of the western hemlock, *Tsuga heterophylla*, was scraped off and made into a coarse bread in the Northwest. The Algonquins also made cakes of the cambium tissue of slippery elm, *Ulmus fulva*. Many other tribes ate bark when food was scarce but they considered it strictly a famine food.

The Indian ate no mushrooms until the white man showed him how, but lichens of a dozen different kinds were used. Perhaps the most interesting is *Alectoria jubata*, a lichen that grows on pine and fir trees in the Columbia River region. It was considered delicious when cooked with camass roots or boiled to a jelly-like mass by itself.

The white man is just beginning to learn the food value of the ferns, of

The turnip-like root of the cow parsnip, also the young shoots; the root of the puccoon, and the flesh between the seeds in the pods of mesquite were foods of the North American Indian.

Puccoon picture, above at the right, by courtesy of the University of Minnesota, Department of Botany.

These and the other five drawings of food plants used by the North American Indians, appearing with this article, have been made at the Garden through the co-operation of the W.P.A.

WILD PLANTS IN THE INDIAN'S DIET, ALL RECOMMENDED TODAY

Upper left: Three native species of onion—Allium canadense, A. tricoccum, and A. cernuum, commonly known as wild garlic, leek, and onion, all of which were enjoyed by the Indians. Upper right: The ground-nut or wild bean, which furnishes food from its root tubers, young shoots, and immature seeds. Lower left: Rhizomes, shoots, and young seed-pods of the butterfly-weed all are said to make pleasant eating. Lower right Unfurling fronds of many ferns were eaten by the Indians, and some can be found in the market today Bracken, of which only the central part of the stem can be used, and the cinnamon fern are shown here.

which the Indians used at least 20 species. Some of these are now being served in restaurants of the Atlantic and Pacific coasts and at least one kind is being commercially canned. The cinnamon fern, *Osmunda cinnamomea,* was used as a spring potherb. The fiddle-heads, or unfurling fronds, were gathered and simmered for an hour, then put into soup thickened with flour. This dish, with a flavor similar to wild rice, was widely eaten. The young fronds of the interrupted fern, *Osmunda Claytoniana,* were also used and considered a good vegetable, tasting somewhat like chestnuts.

The outstanding fern plant used as a food was the common brake or bracken, *Pteridium aquilinum.* The rhizome was used by many tribes, its bark being removed and the white heart roasted. Though it resembles the dough of wheat, its taste is too pungent for most white people, but the Indians relished this nutritious food, particularly in the Northwest. The intermediate part of the frond in the early spring is delicious and when properly prepared it suggests asparagus shoots.

We have had our long walk through the woods and fields and have discovered that sustenance can be found if we but look for it. There is food in the woods, prairies and meadows, along the shores of lakes and rivers, in pools, even on the margins of deserts. We do not recommend these native foods as staple articles of diet but suggest them in cases of necessity. Our present controlled and selected foods cannot be surpassed in flavor, nutrition, digestibility, and satisfaction. A little knowledge of the uses of our native plants, however, does have value, offers a possible new flavor or spice for the gourmet, and provides a source of food in an emergency.

Wild Plants Used in Cookery

By Milton Hopkins,
University of Oklahoma

THE idea of using native American plants for cooking is as old as the aborigines on this continent. Undoubtedly our forefathers derived many more ideas of value from the Indians than they ever gave in return, and one of their most useful lessons was that of obtaining vegetable products from selected herbs, shrubs, and trees.

So if you ever tire of the more or less common foods from your local market—and who does not?—there is a way of bringing to your table some of the most delectable dishes ever tasted, by using ordinary plants that are growing wild in nearby pastures, fields, and woods. Though doubtless acquainted with many, we are inclined to overlook them in preference to commercial fruits and vegetables, and thereby we are miss-

ing the spice of novelty that they might provide in our diet, as well as the benefit of their abundant vitamins.

But before we begin to experiment with them, a word of caution ought to be given. Unless you are absolutely sure of your plant and can identify it as to genus and species, and unless you *know* that it contains no harmful or dangerous chemicals, stay away from it. Ignorance can cause calamities of the most tragic kind, and the game is most assuredly not worth the candle. But if, on the other hand, you are positive that the plants are edible, there are innumerable recipes which you can concoct from them.

For example, the tubers of arrowhead (*Sagittaria latifolia*), which is common on the margins of ponds and swamps and in other moist places of eastern and central North America, are as toothsome a morsel as anyone could hope to enjoy. I have eaten them baked and boiled, as one cooks potatoes, and found them eminently satisfactory. They should be cooked about 30 minutes and are best if they are peeled afterward. The mealy quality of the potato is not present, and the texture is somewhat more smooth. The arrowhead tuber makes a superb dish for picnic suppers and lunches, and if the picnic grounds are not too far distant from a colony, one can make the event outstanding by asking the guests to dig their own tubers and roast them in a bed of hot smouldering coals.

Another plant which might serve as a substitute for the potato is the ground-nut, or wild bean (*Apios tuberosa*). Eaten raw, the root tubers are quite palatable, but they are better when cooked for about half an hour. Boil or bake them and serve them without any seasoning, as condiments or spices spoil the flavor. The ground-nut belongs to the Bean and Pea family and it grows wild as a twining vine in light woods from Minnesota, Kansas, and Texas, all the way eastward.

Then there is the hog peanut, which cannot be excluded from this group. Its botanical name is *Amphicarpa monoica*, and it grows in deep rich woodlands in moist soils and extends throughout the same general range as the wild bean. Although the seeds of this plant are the edible portions, these develop underground like the true peanut and must be dug out. They are somewhat sweetish but more pleasant than the raw commercial peanut, which at best is not particularly agreeable. The Indians ate these hog peanuts raw, as a fruit, and I have tried them several times myself. Unfortunately, no records seem extant which would indicate their value as a substitute for the roasted peanut, nor have I ever tried them this way. But if dug out of the ground they last for several weeks in the house and make a highly nutritious food.

Among the plants producing edible leaves and stems there are so many that space will permit me to mention only a few. Perhaps my favorite dish is a salad of mixed spring greens, all of which can be obtained from roadsides and vacant lots. I like to gather as many different kinds as I can and mix them together in an ordinary wooden salad bowl which has

been previously wiped with the bulbs of the common wild onion. Here is my recipe:

1 large bunch of young curly dock leaves (*Rumex crispus*)
2 or 3 clusters of young basal rosettes of shepherd's purse (*Capsella Bursa-pastoris*)
6 or 8 bunches of young dandelion greens (*Taraxacum officinale*)
3 large bunches of watercress (*Radicula Nasturtium-aquaticum*)
or 2 or 3 bunches of the basal leaves of the violet wood-sorrel (*Oxalis violacea*)

Chop the ingredients thoroughly and marinate just before serving with a dressing of vegetable oil, vinegar, and spices as desired. Serve on a bed of young leaves of curly dock and garnish with the watercress leaves.

This makes a salad of which the most epicurean taste would be proud, and as well as being tasty and attractive in appearance it is extremely rich in vitamins. Endless combinations and variations may be tried from these salad plants, but in my estimation they all require a highly seasoned dressing. As they absorb the oil very rapidly, the greens should not be marinated until immediately before serving. In making the dressing I use as many spices as I have on hand, especially mustard and garlic. These greens usually have a somewhat bitter taste but the dressing eliminates that entirely.

If you hesitate about eating plants raw, then here are some suggestions for potherbs. Purslane (*Portulaca oleracea*) is one of the most common weeds in gardens all over North America and is a noxious pest. Its succulent reddish-purple stems and small, fattish leaves in whose axils appear the tiny yellow flowers are familiar to everyone who has experienced the pleasures of gardening. In my opinion these young leaves and stems, when cooked about 15 minutes in boiling salted water, are far better than spinach or Swiss chard. Their flavor is more delicate, being not unlike that of beet greens. But they cook down at an almost appalling rate, and a mess adequate to serve four people would require several quarts of the fresh greens. But when the weed is so abundant in every garden, the mere gathering of a sufficient quantity is nothing. Of all the potherb-plants, purslane excels. On only one possible count can it be excluded. It does have a slimy aspect, much like the pods of cooked okra, and this feature might make it objectionable to some persons.

Lamb's-quarters (*Chenopodium album*) are also good, are almost as ubiquitous as a weed, and are cooked in exactly the same way.

Another favorite potherb of mine is a plant familiar to all gardeners and the bane of most of them, the common chickweed (*Stellaria Media*) which I cook in boiling salted water for 20 minutes and use it like purslane. (One does tire of the same dishes day after day, even of weeds!) Its taste is somewhat inferior to that of purslane, but I rank it higher than spinach. To retain its delicacy, serve it with plenty of butter rather than with vinegar, and add salt and pepper to suit the taste.

My favorite vegetable, ranking even higher than purslane, is the boiled

young flower parts of the common cat-tail. *Typha angustifolia* and *T. latifolia* serve equally well, but the secret is that one must obtain the young "tails" when they are only a few inches long and while they are still green. I cut off the stems with the young inflorescences at their tips and cook them in boiling salted water for 15 or 20 minutes. When they are tender they may be served either with drawn butter or with a cream sauce, and eaten as one eats asparagus. Unless gathered when they are very young the result is a vegetable so tough and unpleasant that it is not possible to chew it and the whole thing must be thrown away. But give me the young tails, whose taste is like a cross between string beans and asparagus; there is nothing finer.

But what of those plants whose leaves are the sources of beverages? There are many of these but we can discuss only a few. One of the best is the New Jersey tea (*Ceanothus americanus*) whose dried leaves make an excellent infusion. This shrub was abundantly used during the American Revolution as a substitute for imported tea, and although the flavor is not so good it has the same refreshing qualities. The leaves should be plucked when young, in the late spring or early summer, and dried for several weeks in a warm, dry closet. Then they may be pulverized and used as one would use ordinary tea leaves. Lemon improves the flavor as does a touch of cinnamon, but sugar and cream may be added instead if desired. New Jersey tea tastes not at all like Ceylon or Indian or Chinese tea, but it is not a bad substitute, and of all the wild plants whose leaves make good infusions, this is by far the best.

Some people like a tea made from the leaves of either wild bergamot or bee balm (*Monarda fistulosa* and *M. didyma*). The beverage made from either species has a very delightful minty fragrance, and although the aroma is not so delicate as spearmint or peppermint, it is highly prized. I dry the young leaves in much the same manner as those of New Jersey tea, and serve the resulting tea with several slices of orange. This deadens the rather strong minty odor and gives one a much more satisfactory infusion. It is always a novelty, and although I should not care to drink the beverage more than once a week, I consider it a pleasing and refreshing variation from ordinary tea.

Now let us look for a moment at plants with edible fruits and seeds. Here one finds an imposing list. Some make good vegetables, some are best for pies and puddings, many yield jams and jellies of the highest excellence, and quite a few are a good source of beverages. And then, of course, one must include the large number of trees whose nuts are so delicious.

First of all there is the persimmon (*Diospyros virginiana*) which, although it is not abundant northeast of Pennsylvania and New Jersey, cannot be omitted from this paper. It is generally regarded as a useless fruit, but if its rightful place were bestowed upon it by cooking specialists

it would rank well toward the top of any list. As England has her traditional plum pudding for Christmas, so ought America to have her baked persimmon pudding.[1] The tree is so common in central and southwestern North America, and its fruits are so flagrantly wasted that it is a pity to pass them by. If a market could be created for them, whole orchards might be started and the resulting profits to farmers would be considerable. Of course the fruits must never be gathered until several frosts have touched them, thus making them sweet and edible. And if you wish to try persimmon pie, use any recipe for pumpkin pie but substitute the persimmon meat for the pumpkin.

One of my favorite jellies and jams is made from either wild blackberries or raspberries, and often I combine them. The quality is excellent and no finer jam exists. Another superior fruit for jam is the lovely Chickasaw plum (*Prunus angustifolia*), which grows in dense low clumps in sandy regions throughout eastern and central North America, as far north as New Jersey and Pennsylvania. Other wild plums make fine jams, but none have quite the tang and richness of body which characterize these fruits. They also make a delicious fruit pie during the early summer when their reddish-orange drupes hang on the slender branches in great masses.

Then there is the smooth sumac (*Rhus glabra*), whose clusters of pinkish red fruits can be used for a refreshing cold drink. The little drupes are ripe in midsummer and should be picked before they become too old. Their taste is very acid and not at all unlike the lemon. To make this lemonade one cluster of inflorescences should be used for each glass. Crush the young fruits with a spoon to extract as much of the juice as possible. Then add enough sugar to suit the taste (about two teaspoons), cover with water and add ice cubes until the glass is full. The color is a deep pink and the flavor full-bodied. But do not prepare this drink too far in advance, and do not keep it for more than an hour or so in the icebox. It quickly becomes rancid and is entirely useless. For best results it should be prepared and served at once.

In these pages I have discussed only a few of those plants which have a broad distribution throughout northeastern North America. There are, however, several plants which, though they are restricted to the prairie

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[1] Here is my recipe for persimmon pudding:

3 eggs	1 qt. seeded persimmon fruits
1½ teaspoon salt	1 pint cold water
2 cups sweet milk	1 teaspoon soda
3½ cups flour	1 cup granulated sugar

Wash and seed the fruit (to make 1 quart, about 3 quarts of whole fruit are required) and soak them in cold water for about an hour. Then run them through a colander. Mix the other ingredients in the order given, stirring thoroughly. Pour the batter into a greased pan and bake at 400° for one hour or until the pudding is a dark brown in color. Serve either hot or cold with whipped cream or hard sauce, and garnish with maraschino cherries. The pudding keeps well in the icebox for several days.

and plains area of our country, have edible qualities which are very familiar to anyone who has ever lived in this region. They ought, by all means, to be mentioned.

The ground plum (*Geoprumnon crassicarpum* or, as it is often called by some botanists, *Astragalus caryocarpus*) is well known and liked by everyone who has ever eaten its delicious green seed-pods. Resembling small green gage plums, these legumes may be eaten raw as a fruit or cooked as a vegetable like string beans. They also make a pungent pickle.

And what middle-westerner does not know the Indian bread-root or prairie apple (*Psoralea esculenta*), whose tempting, fat rootstocks are dug from underground? It is perhaps the most familiar of the edible wild root-vegetables, and is delectable either cooked or raw. It is the size of a medium white potato and has a smooth texture and somewhat sweetish flavor when it is cooked, more palatable than a turnip and not unlike that of a parsnip.

My objective has been not to compile a list of the many species of edible plants, but rather to discuss only a few whose attributes are well known to me from actual experience with them. There are literally hundreds of others, equally delicious.

Weedy and generally ubiquitous plants can be used in cookery as frequently as they are desired. But those plants whose roots are prized for their qualities may become extinct if they are used too often. So it is best to go easy on them and stick to the leafy weeds.

Medicines From Plants

Panaceas, Charms, and Efficacious Remedies Employed by the North American Indian

By Marion A. and G. L. Wittrock

"MAKE-HIM FEEL-GOOD" was the Indian name for any medicinal herb, and such a plant was prized, respected, and venerated as highly as any food plant. The two were closely linked, for to be unable to eat was to the North American aborigine a form of torture, a sign of sickness, to be overcome with medicinal herbs. The Indian knew that in order to enjoy his food, he must keep himself in good health. When he felt sick, he had the utmost faith in the medicine man of his tribe, and he was a willing patient, taking any and every decoction or brew, and applying any liniment or poultice prescribed. No challenge or doubt ever came to his mind; to him his medicine man was all-powerful. Did not this sacred person have direct contact with all spirits, evil or good? Was not his wisdom even greater than that of the chief, who

rarely acted on important tribal problems before consulting him? The chief of the tribe may have ruled his braves; but the medicine man was the counselor, teacher, healer, comforter, prophet, and wise one of the tribe—one to fear, to follow, to obey.

What was his concept of medicine? Explanation of cause and effect was based on superstition and the supernatural, but application of plant drugs was founded on empirical experience and pragmatic reasoning. A plant juice, a tea from a leaf, or a chewed root was good if it worked; if the medicine failed to cure or heal, the failure was charged to the "evil spirit" who played an important part in the life of the tribe. Should he fail in his prophecy to bring rain, a good crop of plant food, or plenty of game, or err in his diagnosis of the sick brave, the medicine man could always blame the "evil one" and call on the "good spirit" to help him overcome the evil taboo. Thus the medicine and religion of the tribe were closely related.

How much actual knowledge of plants did this medicine man have? Outside of what he gained by experience in healing, most of his learning was acquired from his predecessor; in fact, this knowledge, which was confined to the medicine man and his special "society," was the most sacred thing in the tribe. All members of this elite, secret body were appointed by the acting medicine man. In the Omaha tribe, this group was called the "Shell Society." Young braves could qualify only when they succeeded in passing severe and physically painful tests.

Ethnologists have always found it most difficult to learn the secret knowledge of the medicine man, for the sanctity of this "doctor" came direct from the spirit world, and it was considered disastrous to the tribe to reveal its "medicine" to the "white pagan."

The Legend of Medicine

Supposedly, the practice of Indian medicine in most tribes had been taught long ago by the great spirits of the first tier of the spirit world where the first "medicine lodge" existed. The legend is told somewhat as follows:

One of the kind spirits descended to earth and showed the wise Grandmother (or Mother) Earth the medicine bag with its roots, leaves and fruits. He gave her charge of them and she was to keep and nurture them, and to allow them to grow and obtain added power. The spirit then -his name varied with the tribes -appeared before the tribe and instructed the original forefather of the tribe to build a medicine lodge within a given time, usually four days. On the fourth day the spirit again appeared and sent the young Indians away while he instructed and initiated the elders to the lodge. He gave them fundamentals about the uses of plants and medicines and taught them the proper ceremony for each.

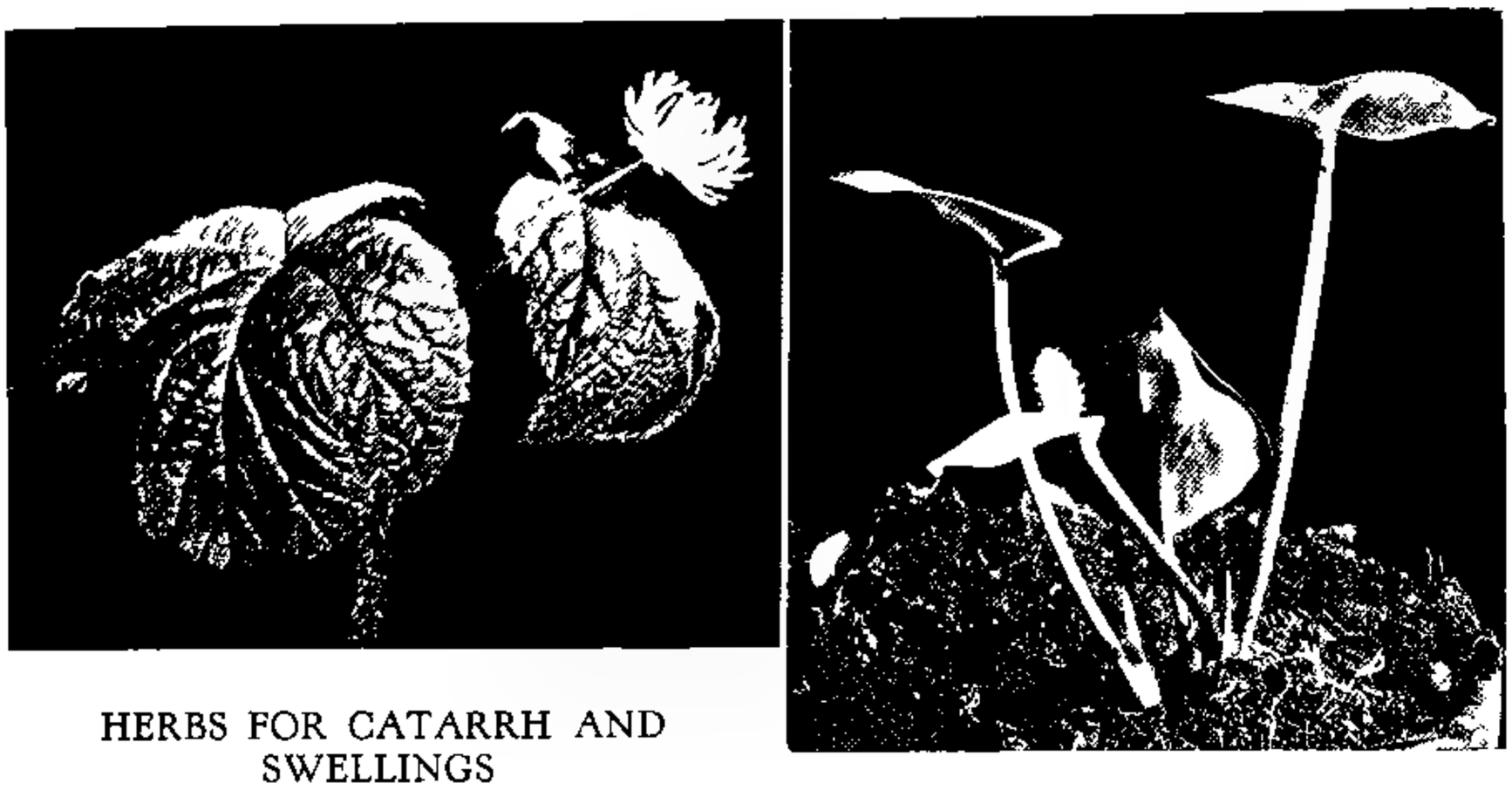
This legend reveals why Indians revered "Mother Earth" and why they always showed their respect, their appreciation for all she had given to them in food, fiber, and medicine. A gift of tobacco was always placed in the hole of a plant that had been dug for medicine, and all the first ripened seed or food was returned to Mother Earth in the spirit of: "Thank you, Mother Earth; you shall have the first."

The proper dance with its impressive costumes and masques, the ritual, and the symbolism it represented were quite as important as plant medicines in the art of healing. The more baffling an illness the greater and longer was the dance, through which the spirits were invoked for consultation. While the sympathizers usually the members of the Society and of the immediate family, and sometimes even the Chief—sat in a circle around the patient to keep out evil spirits, the medicine man, to the beat of the tom-tom, danced himself into a trance to gain the proper entrance to the spirit world for advice. If the trance failed to develop he would resort to drugs to gain the effect. The diagnosis thus proceeded until the patient either recovered or he passed on to the "happy hunting ground," the Indian's heaven, never to return. A fee was charged, the amount depending on the nature of the sickness, payable in the form of beads, blankets, baskets or hides, even ponies.

The medicine lodge was the Indian's drug store, the medicine man's sanctum. Minor ailments were treated there. But if the case was serious, the medicine man called on the patient and administered his decoctions. If no change developed, he gave a stronger herb. Should this also fail, he resorted to the smoke treatment, which usually consisted of burning leaves, stems and, for some conditions, flowers, thus causing a smoke for the patient to inhale; or he heated stones for a sweat bath in a "steam tepee," throwing essential oil plants on the hot stones for their volatile vapors. If these remedies failed, the illness was considered most serious; he then resorted to more severe treatments and mystic symbolisms. If the patient was in a coma, and showed little sign of life, the medicine man would resort to a strong sternutative, a sneeze medicine. The pulverized root bark of the Kentucky coffee-tree, *Gymnocladus dioica,* was so used. If one spark of life still existed in the patient, he would certainly sneeze -sometimes fatally. Many such sneeze-inducing plants were available to the medicine man.

If at this point the patient still showed no signs of improvement, and there was still life, the medicine man then called on the higher spirits through the dance.

We have often heard people express the idea that the Indian must have been healthy because he lived outdoors in good fresh air and sunshine with plenty of exercise and good natural food. If this were all true the Indian population at the advent of Columbus could easily have been so large that our forefathers would have had trouble finding an open place



HERBS FOR CATARRH AND SWELLINGS

The root of the golden-seal (shown in flower at the left) was used by the Indians, as it is used by doctors today, for catarrhal conditions. Leaves of the wild calla (right) gave the Indians a poultice for swellings.

to settle. What prevented the growth in Indian population? One of the many reasons is most obvious: sanitation, a problem that was never solved by the aborigines. When a camp ground became uninhabitable, the tribe would simply move to another site. Whole tribes have been wiped out with one stroke of a bacterial pestilence that possibly gained its start in the rubbish heap. Sickness was ever present for the medicine man to cure.

Remedies for Common Stomach Ache

Stomach trouble, often caused by over-eating, was one of the major problems of the medicine man. Indians enjoyed eating, but did not always eat wisely. Many of the plants included in their diet were so fibrous and indigestible that explorers exclaimed on the possible condition of the Indian's stomach. They could not always digest the food that was eaten. After a big feast, many a brave would seek his medicine man, holding his hand on his aching stomach. What was the remedy? Northern America contained more than 100 plant species from among which the Indian doctor could choose a stomachic. The outstanding remedy was the sweet flag or calamus root, *Acorus Calamus,* considered by many tribes a cure-all. The ailing Indian would simply chew the root a long time, then would sometimes swallow the pulp. So valuable was this root considered by the Indians that it was used as a medium of exchange. Why not, when it was considered a good remedy for dyspeptic conditions, fever, flatulence, cough, toothache, and colic? The whole plant was used in the smoke treatment for colds. Hunters made garlands of the leaves to hang around their necks for their pleasant odor and mystic powers. Dakota

warriors chewed the root to a paste which they rubbed on their faces to prevent excitement and fear in the presence of their enemies. White men, too, have considered calamus root a good remedy. It was listed in the pharmacopoeia of the past, and one druggist in New York City informed us that the root was dispensed in his store as late as 1925. It is still a popular medicine in Europe.

Among other plants that the medicine man used as stomachics were the rhizome of wild ginger, *Asarum canadense;* of colic-root, *Asarum virginicum;* and of the lovely aquatic plant called the water-shield, *Brasenia Schreberi;* the leaves and roots of pipsissewa or prince's pine, *Chimaphila umbellata;* and the orange-colored root of the gold-thread, *Coptis trifolia.*

The Indian doctor may decide that the proper medicine is an emetic, a mild laxative, or even a strong cathartic. What an amazing assortment of herbs were available! If emetics were his decision, he could choose from among 137 species of plants; laxatives could be had from 68 species, and cathartics from 152 which grew wild north of the Mexican border. Not all were available in any one region, but every medicine bag contained a large number of different kinds. The buckthorn was one of the important emetic plants of the Indians in the Northwest. To us, as cascara sagrada, *Rhamnus Purshiana* is known as one of the safest and best laxatives in the world, much surpassing the European species, *Rhamnus cathartica.*

In the East, one of these many excellent emetic plants was the witch hazel, *Hamamelis virginiana,* a brew of the inner bark being used particularly in cases of poisoning. The Indian also found it useful as a liniment to cure lame backs or to be rubbed on athlete's legs to keep them limber. The volatile oil of the plant was used in sweat baths for many ailments. Lotions were prepared for skin troubles and a decoction was highly valued as a wash for sore eyes. How similar are our own uses, today, of this plant. Other interesting emetics were the black drink, yaupon, or emetic holly, *Ilex vomitoria,* the compass-plant, *Silphium laciniatum,* and the star-flowered Solomon's seal, *Smilacina stellata.*

Headaches for the Medicine Man to Cure

There is not a race in the world that is immune to headaches. Indians suffered from them too, caused by the same factors —over-eating, domestic problems, tribal wars, worry, and excesses of all kinds. The medicine man had his headaches too, his own and those of his tribe. What magic could he resort to from his bag of remedies? Counter-irritants gave the quickest relief. An oil, liniment, powder, or salve applied externally would cause a greater pain by its sting, smart, or heat with the result that the headache might become secondary and eventually disappear. Though we too recognize the value of counter-irritants, very few of ours are the same as those used by the Indians. Perhaps the most interesting primitive headache

cure was the jack-in-the-pulpit, *Arisaema triphyllum,* the corm of which was pulverized and dusted on the aching temples. The theory was that perspiration would activate the calcium oxalate crystals in the powder and cause a burning sensation which would become so intense that the headache was gradually forgotten. Among other headache remedies from plants were the crushed seeds of wild columbine, *Aquilegia canadensis;* tea of the leaves and flowers of yarrow, *Achillea Millefolium;* an inhalant of crushed roots of spreading dogbane, *Apocynum androsaemifolium,* vaporized on live coals; and a decoction of the leaves of the headache-weed, *Clematis Douglasii.*

Colds and Fevers Among the Indians

Did the Indians also suffer from colds as we do today? Yes, and the medicine man had even more remedies than we have for this still unsolved scourge of man. The general medicine bag might offer any of 88 different kinds of plants to use against colds in the form of a tea, a poultice or plaster, or compounded with other species in a cough syrup. A quart of tea made of the inner bark of the hemlock, *Tsuga canadensis,* was expected to cure a cold within two days.

Fevers were ever a problem for the medicine man. Some of the simple ones he could recognize readily, and over the country there were some 113 species of plants from which one tribe or another selected a source for a febrifuge. Some of these medicines we know to be effective: the root of the wild sarsaparilla, *Aralia nudicaulis;* the leaves of the spicebush (sometimes called fever-bush), *Benzoin aestivale;* a decoction of the roots of blue cohosh, or great-fever-medicine, *Caulophyllum thalictroides.* The bark of the American Judas-tree or redbud, *Cercis canadensis,* and a tea from the leaves of *Penstemon grandiflorus* were also used, likewise a tea from the leaves and berries of wintergreen, *Gaultheria procumbens,* to break a fever or cold, to cure rheumatism and lumbago, and in general, to "make him feel good." White men learned the medicinal properties of the wintergreen from the Indians, and incorporated it into their pharmacopoeia as Oleum Gaultheria.

The medicine man apparently knew that sometimes a fever may be allayed or broken by inducing perspiration. In the various tribes more than 85 different species were known as diaphoretics. One was the sassafras, *Sassafras variifolium,* the essential oil of which is the Oleum Sassafras of the U. S. Pharmacopoeia. The mountain tea, *Solidago odora,* and the common boneset, *Eupatorium perfoliatum,* were also used for the relief of fevers.

Because he had no knowledge of bacteria, many fevers could not be diagnosed by the medicine man. Yet he recognized lung troubles, particularly when a cough was associated with the fever. Depending upon the region, he might prepare for pulmonary conditions a balsam decoction

THREE MEDICINAL PLANTS

From the bark and roots of the fringe-tree (left) a decoction was made for healing sores. The witch-hazel (center) was the source of a lotion for sore eyes. Leaves of the spice-bush (right) provided a febrifuge.

from the balsam fir, *Abies balsamea;* a tea of the wild sarsaparilla, *Aralia nudicaulis;* or sweet sage, *Artemisia frigida;* a brew of dried flowers of the elderberry, *Sambucus caerulea;* or of the leaves and flowers of the gum-plant, *Grindelia robusta;* or a preparation from the consumptive-weed, *Eriodictyon californicum.* Indians taught the missionary padres in California the medicinal virtues of this latter plant, which became known as yerba santa (holy herb), for it was esteemed as a general tonic and an excellent medicine for bronchial troubles. Many of the above mentioned species were used by the school of eclectic physicians in America.

Liver and kidney ailments were diagnosed by many symptoms for which the medicine men across the continent had more than 36 kinds of plants as a remedy. Two hundred or more American species were used as diuretics by the Indians and the eclectics.

Heart trouble was also recognized by the medicine man, but he found very few medicines to combat this serious ailment. A tea from the steeped leaves of the southern wild ginger, *Hexastylis arifolia,* and a decoction from the roots of the daisy fleabane, *Erigeron ramosus,* were both drunk for heart trouble by the Catawba Indians, and the valuable Senega root, *Polygala Senega,* which is now an official drug in the U. S. Pharmacopoeia, was used by others to overcome this illness.

Antiseptics and Healing Agents

The medicine man was truly practical with his antiseptics, healers, and dressings for wounds in general. His medicine bag was his "first aid kit," ready for any emergency, from a simple mishap to a tribal war. Having at hand many astringents which acted as antiseptics, he frequently did the job practically and efficiently. For wounds in general he resorted to poultices, brews and decoctions of leaves, roots, and barks. Wound medicine was obtained from 101 different plant species. Little-buffalo-medicine or wind-flower, *Anemone canadensis,* was one of these wound medicines highly esteemed for many ills. A brew of the roots was applied externally and taken internally, and was also used as a wash for sore eyes. Meskwaki Indians of Wisconsin used this medicine as a remedy to cure crossed eyes. The same tribe used a small piece of root as a lozenge to clear the throat so that they could sing well in the medicine lodge ceremony. The root chewed slowly to a pulp and placed on a wound often served as a styptic.

Another remarkable styptic was a species of puffball, *Lycoperdon gemmatum,* one of the few fungi that the Indians dared to use, since, in general, fungi were definitely feared. The spores of the species would merely be dusted on the bleeding wound. One of the most valuable antiseptic styptics was the staghorn sumac, *Rhus typhina,* the bark of which has a puckering effect because of the tannin it contains.

Wounds that did not heal well were classed with sores, and these, in general, were treated either by fresh plant juices, saps, tissues, barks and leaves, or by these substances prepared in the form of poultices, salves, or decoctions. The fringe tree, *Chionanthus virginicus,* and the leaves of the beautiful yellow clintonia, *Clintonia borealis,* and of alum-root, *Heuchera americana,* were among the 70 or more plant species used on sores.

For minor cuts the "doctor" had a choice of 32 species of plants, while for bruises he had more than half a hundred. He also had medicine for burns and scalds, most of the 48 species so used having tannin as a basic ingredient. One of the surprising remedies for healing burns was the down of the fruit-spikes of the common cat-tail, *Typha latifolia.* The same down added to rendered fat of the coyote was made into a plaster to be applied to the pustules of smallpox patients.

Bites by insects, scorpions, dogs, and snakes were always treated by the medicine man. The Seminole Indians used a species of iris as a healer for alligator bites (if the reptile did not take too big a bite). Snake bites, in general, were treated by antidotes obtained from at least 55 different species, while rattlesnake bites were counteracted by more than 24 species, most of which are recognizable today by their common name such as snakewort, snake-root, snake-bane, etc. The rattlesnake weed, *Echinacea angustifolia,* was applied extensively by the Indians and later by white traders as an antidote for poisonous bites, particularly by rattlesnakes. A poultice of the leaves of the rattlesnake root, *Prenanthes alba,* steeped in hot water was also considered effective.

Sedatives, Tonics, and Panaceas

Sedatives for nerves were also prescribed by the medicine man. Of these he had, as our records show, 44 species from which he could select. Narcotics also had their place in the medicine lodge, but their use was mainly for the medicine man himself, for the narcotic effect to bring on visions and contacts with the spirit world.

When the patient was convalescing, the medicine man would resort to tonics to aid quicker recovery. We have found records of nearly 250 species that were so used. More than 100 kinds of stimulants were prescribed, some to stimulate appetite, others for the heart, liver, intestines, nervous system, respiration, stomach, and as revivers from faints, comas and other similar conditions.

The medicine man considered more than 30 species as cure-alls. Some of these panaceas have already been mentioned. Our common bearberry, *Arctostaphylos Uva ursi,* was one of the important medicines used to relieve any ailment, and it was also used as a seasoner to mask the taste of other medicines. In the National Formulary it is recognized as an official medicine for its diuretic, tonic and astringent qualities. The American wild mint, *Mentha canadensis,* was brewed into a tea for many complaints. Another decoction was made from New Jersey tea, *Ceanothus americanus.* Because the roots were matted, twisted, and knotted, they suggested strength, and because the inner bark was colored red it symbolized the intestines. Therefore this plant was looked upon as a powerful medicine for all stomach and bowel ailments. Another panacea was the Missouri gourd, *Cucurbita foetidissima.* It was said to possess special mystic powers, so only authorized Indians dared to handle this sacred plant, about which many stories told were colored with fatal experiences to the careless. As a remedy for any ailment, a portion of the root from the part corresponding in position to the affected part of the patient's body was used. Other interesting cure-alls were the Indian hemp, *Apocynum cannabinum;* sweet cicely, *Osmorhiza longistylis,* and the butterfly-weed or pleurisy-root, *Asclepias tuberosa.*

Many questions have been asked on the value of Indian herbs. Some of these questions are: What has the medicine man given us? Are his medicinal herbs of any value? What of his primitive practice, his form of diagnosis? Has this strange mystic technique contributed something to the knowledge of man?

Most of his medicines were remedies and as remedies they were not necessarily good curatives. Civilization has, however, accepted many of his herbs, and the best of them are now being utilized by the white man, as proved by our record of 45 species that have been at one time or still are official medicines in the U. S. Pharmacopoeia or National Formulary. We have already mentioned a few of these official drugs. Others of interest are:

Common Name	*Latin Name*	*Present-day Use*	*Indian Use*
		U. S. PHARMACOPOEIA	
Male Fern	*Dryopteris Filix-mas*	Vermifuge	Vermifuge
May Apple	*Podophyllum peltatum*	Emetic and cathartic	Insecticide, snake bites, dropsy and rheumatism.
Wild Cherry	*Prunus virginiana* (*P. serotina*)	Bark for bitter tonic, stimulant and sedative, berries to mask med. flavor.	Bark for coughs and colds; inner bark as a mask for med. flavor.
Virginia Snakeroot	*Aristolochia Serpentaria*	Stimulant, tonic for stomach; diaphoretic valuable for fevers.	Brew for stomach pains and fevers.
Sweet Gum	*Liquidambar Styraciflua*	Antiseptic, disinfectant especially for cuts.	Cuts and bruises (very valuable medicine in Mexico since earliest times).
American White Hellebore	*Veratrum viride*	Cardiac and muscular sedative.	Wounds and aches, headaches.
		NATIONAL FORMULARY	
Golden Seal	*Hydrastis canadensis*	Tonic and catarrhal conditions	Remedy for eczema; inhalant for catarrh.
Juniper	*Juniperus communis*	Essential oil, diuretic and aromatic	Diuretic, flavor and asthma.

It is surprising to note in the above list the similarity of Indian remedies compared with today's official use of the herbs. With few exceptions they are alike. Eclectics, however, used a great many more of the native plants; in fact, we estimate that they used at least 300 different species, or about 17% of the total number of medicinal herbs that were used by the American Indians.

The white man still has much to learn about the uses of plants from his predecessors on the North American continent. While some of the Indian's remedies which were adopted early have recently been dropped

from official use in medicine, largely because of the development of synthetic products, others, when they are tested, may yet prove efficacious. As the white man learns about these plants, he will be wise if he also adopts the Indian's belief that the "medicine man" is all-powerful and that *only he* has the knowledge and right to determine which plant shall be used to cure an ailment. So when the white man becomes ill, let him remember the Indian, who never prescribed for himself, but who faithfully followed the word of his tribal "doctor."

ANNOUNCEMENTS
of forthcoming events at
The New York Botanical Garden

INTERNATIONAL FLOWER SHOW

"Food and Drug Plants of the North American Indian" is the subject of the Botanical Garden's exhibit this year at the International Flower Show in Grand Central Palace, New York City, March 16-21. More than 100 kinds of plants are to be shown, accompanied by labels that describe their uses. The material selected for the exhibit is based on the research of Mr. and Mrs. G. L.Wittrock, who have also contributed the two leading articles to this issue of the Journal.

* * *

HERB CONFERENCE

April 7 and 8 in the Museum Building

Open to the public without charge

MRS. HELEN MORGENTHAU FOX, *Chairman*

PROGRAM

TUESDAY, 10:30 a.m.

Address of Welcome	DR. WILLIAM J. ROBBINS, Director, New York Botanical Garden
The Back-Yard Herb Garden	MRS. HELEN M. FOX, Advisory Council, N.Y.B.G.
The Use of Herbs in Cooking	MISS EDITH M. BARBER, Food Editor, N. Y Sun
Herbs in Cosmetics	MISS MALA RUBINSTEIN, Rep. Mme. Helena Rubinstein
Herbs in Perfumery	MR. CHRISTIAN WIGHT, Perfumer-Chemist

TUESDAY, 2:30 p.m.

China's Contribution in Medicinal Herbs	DR. W. M. PORTERFIELD, U. S. Dept. Agri.
Spices—Past, Present, and Future	MR. M. L. VAN NORDEN, Amer. Spice Trade Asso.

WEDNESDAY, 10:30 a.m.

Address of Welcome	DR. WILLIAM J. ROBBINS, Director, New York Botanical Garden
North American Indian Customs with Medicinal Plants	MR. G. L. WITTROCK, Curator of the Herbarium, N.Y.B.G.

S. America's Contribution in Medicinal Herbs DR. H. K. SVENSON, Brooklyn B.G.
Motion Picture—The Production of Essential Oils in the Western Hemisphere
Shown through the courtesy of Fritzsche Bros., Inc.

WEDNESDAY, 2:30 p.m.

Commercial Production of European Drug Plants in America
DR W J. BONISTEEL, Professor of Botany, Fordham University
Some Important Drug Plants and their Role in Medicine
DR. C. C. LIEB, College of Pharmacy, Columbia University
Summary of the Conference DR. W J. BONISTEEL, Professor of Botany, Fordham U.

Luncheon and tea in which herbs will be featured will be served on both days by the Advisory Council of the New York Botanical Garden and the New York Unit of the Herb Society of America.

Some of the papers from this two-day conference will be published in whole or in part in forthcoming numbers of this Journal.

* * *

SPRING LECTURES

The spring series of free Saturday afternoon lectures at the New York Botanical Garden will open March 21 with a talk to be given in Chinese costume by Mr. George Kin Leung, who will describe the garden at his home in China and give comments on Chinese flowers. The following Saturday Dr. W. H. Camp will speak on his plant hunting expedition in Oaxaca. The complete schedule of lectures will be published in the next Journal. Meanwhile, a card announcing the subjects and speakers will be mailed free to any person requesting one.

APRIL JOURNAL

More information on wild plants of North America that can be used for food will be given in an article entitled "Edible Weeds of Wayside and Woods" written especially for this Journal by Helen Morgenthau Fox. Also in the April Journal will appear a continuation of the series of illustrated articles on succulent plants being written by E. J. Alexander of the Botanical Garden's staff.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Unsung Benefactor of Modern Society

RUBBER'S GOODYEAR. Adolph C Regli 248 pages, illustrated Julian Messner, Inc., New York. 1941. $2 50.

Whenever I read a book of this nature the thought invariably occurs to me, how desirable it would be for grade-school readers to be concerned more with the contributions of great discoverers and inventors rather than the antics of hero warriors, be they Greek, Roman or otherwise.

Here in the life of Goodyear, as in the lives of so many other unsung benefactors of modern society, we find those qualities of persistence, foresight and sacrifice

which have been associated with the real benefactors of mankind. The opprobrium of the debtor's prison, the humiliation of bankruptcy, ill-health, sorrows and poverty were Goodyear's rewards for discovering the vulcanization process in the handling of rubber. Another, undoubtedly, would have made the discovery, had he not, but many years might then have elapsed before that accomplishment which taught how to overcome its brittleness in winter and its odorous gumminess in summer. Simple things, but it took one man's lifetime to show the world, and in this volume is the story of his labors.

E. H FULLING.

Herbs in the Kitchen

MAGIC IN HERBS. Leonie de Sounin 208 pages, illustrated, indexed M. Barrows & Co, New York, 1941. $2.

Leonie de Sounin's book will prove an enchanting introduction to herbs. Its "magic" will enthrall even those who already think they know their subject.

The author's recollections of years of fragrance in garden, kitchen and "grandmother's laboratory" in Austria, where she was born and brought up, stimulated her in her new home in this country to experiment with herbs and adjust recipes to the facilities and requirements of today. Her enthusiasm is contagious; and her emphasis on the need for individual experimentation should be taken to heart.

While some of the menus are impractical for the average marketer, her chapter on vegetables should prove a boon and an inspiration to all who are anxious to reduce their food budget.

Simple gardening instructions conclude the volume, pleasantly interspersed with additional comments on the use of each herb.

MARCIA GARRICK.

Notes, News, and Comment

Correction. The caption for the illustration of *Viburnum tomentosum* var. *sterile,* appearing on page 41 of the February Journal, referred to the species, *Viburnum tomentosum,* and not to the variety which was pictured. This variety bears no fruit.

Visitors. Vicki Baum and her son, Wolfgang Lert, have visited the conservatories and library at the Garden several times recently to gather some authentic botanical and horticultural material for Miss Baum's next novel.

Rupert C. Barneby, amateur botanist of Beverly Hills, Calif., left for the Coast after spending six weeks in the Britton Herbarium studying the genus *Astragalus.*

Prof. Marie-Victorin, Director of the Montreal Botanical Garden, stopped on Feb. 16 at the New York Botanical Garden, where he consulted with J. P. Carabia on the flora of Cuba, on his way to Cuba for a trip scheduled to last for several months.

Other visitors to the Garden this past month included Frank Egler from the New York State College of Forestry at Syracuse University; Dr. Anna Mary Carpenter of Bethlehem, Pa.; Carl Wittner from the Botany Department at Yale, with Mrs. Wittner; Dr. and Mrs. H. N. Wheeler of Washington, D. C.; Miss A. Kogon, a former student from the Sorbonne; Dr. and Mrs. Charles J. Lyon of Dartmouth; and Mrs. E. R. Sansome of England who is at present in the Department of Genetics at Cold Spring Harbor where she is studying the genetic physiology of the pink bakery mold, *Neurospora.*

Luncheon. On Feb 9, 24 members of the Advisory Council of the New York Botanical Garden held a luncheon in the Members' Room. After the business meeting Mrs. Jerome W. Coombs gave a talk on Alaska.

Art from Flowers. Textile designs which have been made from flowers found in the greenhouses and in library books at the New York Botanical Garden have been on view since mid-November in the display rooms of Charles Bloom, Inc., in New York City. Seven Pan-American plants are represented: *Stetsonia* for Argentina, *Calathea* for Brazil, the coffee plant for Costa Rica, *Gunnera* for Ecuador, banana plant for Panama, *Beaumontia grandiflora* for Honduras, and *Lefcasti* for Guatemala. With the materials are shown the original paintings made by artists who worked for several weeks at the New York Botanical Garden.

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To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

Pkwy., or, coming from Westchester, turn we

THE CORPORATION OF THE NEW YORK BOTANICAL GARDEN

The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

The Advisory Council consists of 12 or more women who are elected by the Board. By custom, they are also elected to the Corporation. Officers are: Mrs. Robert H. Fife, Chairman; Mrs Elon Huntington Hooker, First Vice-Chairman; Mrs. William A. Lockwood, Second Vice-chairman; Mrs. Nelson B. Williams, Recording Secretary; Mrs. Townsend Scudder, Corresponding Secretary; and Mrs. F. Leonard Kellogg, Treasurer.

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JOURNAL

OF

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

RECOGNITION

THE awards that were granted to the New York Botanical Garden and the crowds that attended its exhibit last month at the International Flower Show give gratifying evidence of the public's appreciation of the work of the Garden that is carried on as a public service.

For its display of Food and Drug Plants of the North American Indian, the Garden received a gold medal from the Flower Show committee, and "in recognition of the public value of its splendid educational and historical exhibit," a silver medal from the Federated Garden Clubs of New York State.

In addition, a new Chinese vegetable, a dozen plants of which were shown, brought a cash prize, and a specimen of *Aspidistra* bearing 457 leaves, believed to be the largest plant of its kind ever exhibited in New York, brought a cultural certificate from the Flower Show.

As is indicated by the statements made with the awards, these combined exhibits brought old and new food plants to the attention of the people and offered them a fine example of horticultural practice as a goal toward which they might strive with other plants. It opened the way for a broader understanding of some of the background of their country and gave them a promise of something new. Altogether, it was a display that stimulated the mind and intensified the feeling for the usefulness and beauty of plants as essentials of life.

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JOURNAL
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Problems And Possibilities In The Growing Of Drug Plants

By William J. Bonisteel
Fordham University

OUT of the total volume of approximately 800 botanical drugs* used in this country, the United States formerly imported more than 30 percent of its supply from Europe. With our entrance into the war in the Orient another 25 percent of our crude drug sources has been removed from commerce. Nearly fifty countries that formerly supplied us with drugs are now cut off as potential sources of supply. A shortage of imported items has resulted in price advances and, in many cases, the withdrawal of the drug from commerce.

The prices of a few selected drug items will indicate the trend of the market over the last thirty years.

Price Variation in Crude Drugs

Item		Highs of 1913	World War I	1936	1939	Before Pearl Harbor, Fall 1941
Aconite root	lb.	13	.90	42	.25	no stocks
Belladonna root	lb.	.09	4.50	.15	.17	2.40
Caraway fruit	lb.	.08	.69	.11	.09	1.05
Chamomile flowers	lb.	.21	1.35	.37	.28	3.25
Cinchona bark	lb.	.20	.80	.36	.55	.85
Digitalis leaves	lb.	.08	.70	.25	.36	.40
Henbane leaves	lb.	.12	2.10	.24	.14	3.40
Spanish Saffron	lb.	11.50	16.00	13.00	29.00	39.00
Stramonium leaves	lb.	.08	.22	.09	.13	.32

This table makes it appear that to raise any one of these products would be a profitable business, but the situation needs some analyzing. Not only are certain soils and climates unsuitable for some crops, but in several instances the requirements of the growing, harvesting, or processing

*The term "drug" is used here in its broadest sense to include substances used in medicine, essential oils, culinary herbs, spices, and plant products used as insecticides.

of the plants are beyond the skill or equipment of the average gardener. Yet dealers in medicines and other special products want these substances produced in the United States. Others are interested in drug culture as a means of national defense.

Many of our botanicals that have come from central Europe have been obtained from native plants there, either wild or cultivated. Few persons have ever attempted to grow them in this country, because it is not possible for us to compete with labor conditions abroad.

Seeds and Sales

Another serious problem that we face is the inability to get seed for the propagation of native stocks. Drug houses do not carry stocks of seeds and commercial seedsmen never have calls for these items in normal times. Individuals having a few medicinal plants should carefully save all seeds for future plantings. If not used they should be sent to persons or institutions that want them. Every botanical garden has been swamped with calls for seeds but in normal times such collections are not made. Botanical gardens do not as a rule feature drug plants in their general displays, and of course do not have seeds for sale. We are short of many drug items and some will not be obtainable until peace is once more established.

One of the most unfortunate factors that has centered attention upon the shortage of crude drugs has been the false newspaper and farm journal accounts. For example, one farm journal stated that digitalis would be $5 a pound in the fall of 1941. Naturally, this created considerable attention for with a yield of 500 pounds per acre one could reap a fortune from a few acres. A little study would have shown that many companies grew their own and, as is indicated in this article, the plant may be obtained from the wild in the northwestern part of this country. Seventy-five acres certainly would take care of all our domestic needs. Another report stated that Michigan could produce millions of dollars worth of crude drugs. Essentially that is true, but one could not sell them for there is no market for such a huge production. Arithmetic must be considered in the culture of plants for crude drug products. Any oversupply lowers the price beyond a figure that will bring a profit to the grower.

Our Normal Needs

Twenty acres of aconite, based upon a yield of 500 pounds of dried drug per acre, would supply our domestic needs. At the prevailing price of 1913 this would give a yield of $65 per acre. If tubers were available for propagation a crop could be procured in the second year. Unfortunately, tubers of this plant are not available for commercial production. Using seeds it would take four years before a crop became available

During the period of growth the plants need clean cultivation. During the first World War when aconite root was 90 cents a pound the gross yield per acre would be $450 and this would be an attractive horticultural project. If, however, the high price resulted in a large increase in the acreage planted, the price would be forced down and growers would take a heavy loss. Growing drug plants involves a considerable risk.

It is estimated that less than 1,000 acres would supply the needs of the United States in normal times for the following drugs: belladonna (*Atropa Belladonna*) 400 acres; digitalis (*Digitalis purpurea*) 100 acres; stramonium (*Datura Stramonium*) 300 acres; henbane (*Hyoscyamus niger*) 200 acres. Several of the commercial drug companies grow their own digitalis. In Washington and Oregon, where it has spread from gardens, this plant is found growing wild, and sufficient material is available for practically all our needs. Stramonium similarly has gone wild in many parts of the United States and could be collected if the labor situation permitted. Drugs from plants growing in the wild may be collected in rural districts during periods of economic depressions. The same condition prevails in other countries and when general business is good it is hard to obtain collectors for drug plants.

Belladonna Culture

One of the most ambitious programs for the cultivation of belladonna has been undertaken by S. B. Penick & Company of New York, one of the world's largest dealers in crude drugs. Belladonna is one of the items that we have not been able to produce in any large amount. Yet not only are we forced to grow enough for our own use, but now we have to supply our allies with this drug, which is one of the sources of atropine. This company has selected large and small acreages in several states throughout this country. They have furnished seeds to the growers and will supervise as much as possible the cultivation of this important drug. This project has the approval of the United States Department of Agriculture and other interested Governmental Agencies. Despite the risk which always accompanies ventures in drug cultivation, this company is attempting to relieve the shortage and prevent high prices.

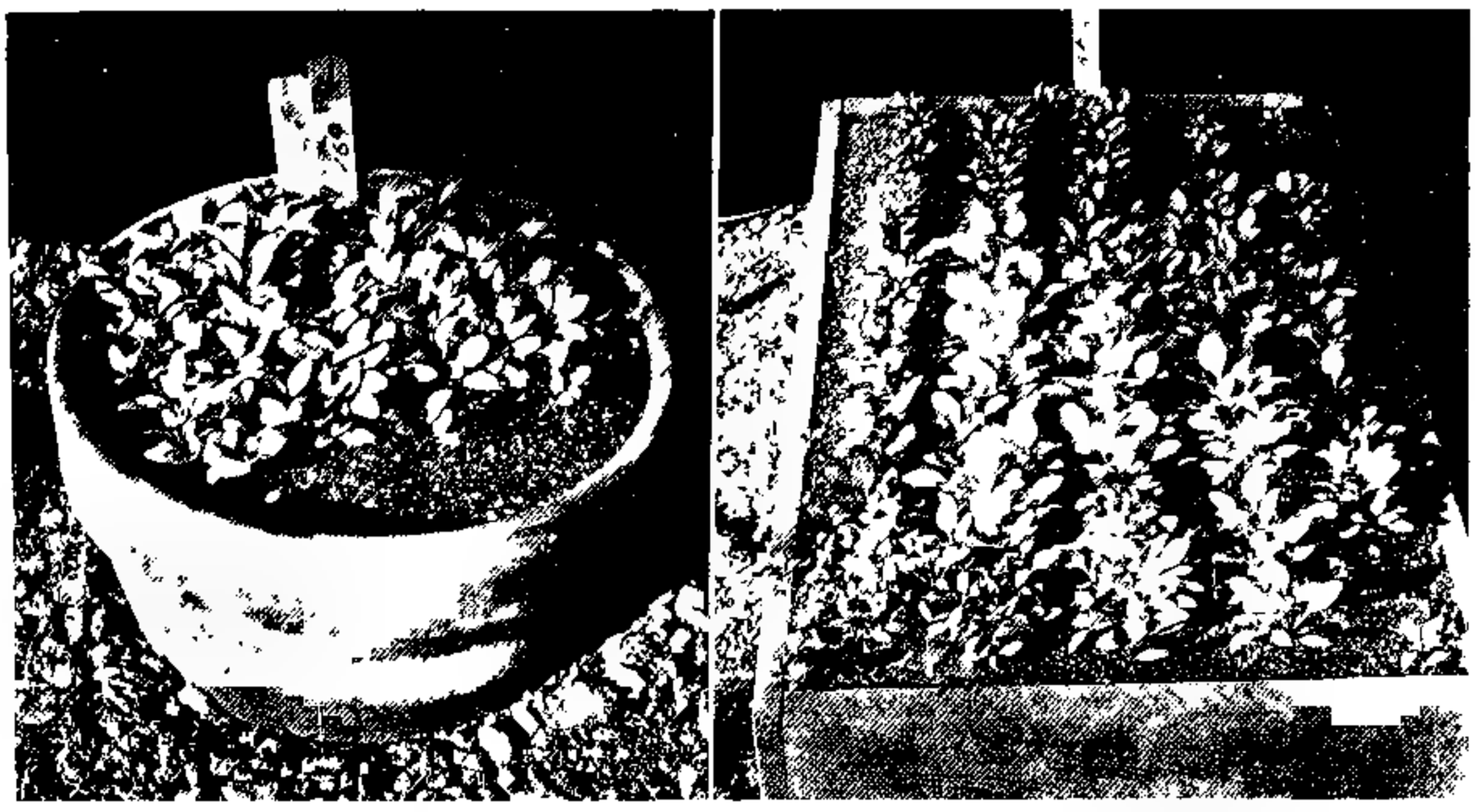
Belladonna was grown to a limited extent during the previous World War, but for reasons of price the culture ceased when normal trade relations were re-established. Last year one grower with approximately 60,000 seeds was able to have only 60 plants come to maturity. It is estimated that about 200 to 300 acres of belladonna were grown last year and perhaps not more than 25 acres gave a satisfactory crop. Since this was the first year of cultivation on a large scale it is hoped that growers will benefit from the experiences of last year. The culture of belladonna is here outlined briefly and will suffice as an example for the cultivation of many other drug plants.

The seeds may be started under glass and then transplanted to flats and later planted out in the field when all danger of frost is over. The soil must be in a good state of cultivation and should have been deeply plowed, since belladonna roots extend a considerable distance into the ground. Approximately 7,000 seedlings are needed for an acre. These may be planted out in rows or equally spaced so that they may be cultivated in both directions. It is necessary to keep the plants free from weeds and cultivated during the entire growing season. The belladonna plant is subject to many plant diseases and it may be necessary to spray repeatedly for insect control. In most sections of this country belladonna seeds planted in the spring will give a crop the first year. The yield per acre is approximately 500 pounds of dried leaves. All parts of the plant contain alkaloids, but the roots are seldom collected the first year because they are relatively small.

In the region of New York seeds will mature the first year. After the drug is collected by cutting off the tops the roots will stay in the ground and the following spring will produce several new shoots and another harvest can be collected in the fall. The roots may be dug this year and a yield of approximately 150 pounds of dried material may be collected from an acre.

The leaves and tops of belladonna are collected when the plant is in flower. It is obvious that such green plant material will contain a large amount of water and it is necessary that the over-ground portion be very carefully dried in the shade before the drug is shipped to the dealers. The danger is largely from mold growth which destroys the drug for commercial use. For small amounts, barns may be used as drying sheds, but when large acreage is involved it is necessary to provide special drying facilities, which increase the cost to the grower.

For many years we have maintained at Fordham University a small plot of belladonna which has been highly successful. The plants are allowed to stay in the ground until heavy frosts have come. At this time the berries are fairly well dried. These are crushed by hand and scattered over another small plot and raked in lightly and left until the following spring. As a result, in early May a vigorous crop of seedlings is obtained. Such a method cannot be used commercially but it indicates that plants may be grown in seed-beds in the open and transplanted from there directly to the field. With the scarcity of belladonna we have been experimenting with the culture, and the two pictures show that it is possible to speed up the activities of nature, giving not only a higher percentage of germination but a much more vigorous type of plant. From our experiments it is evident that most of the belladonna seed used for plantings has been gathered too early and the seed has not had a chance to mature properly. Seeds collected from many sources indicate that the average germination may run from 10% to 20%.



Belladonna seedlings raised at Fordham University, showing the advantages of treating the seeds Both lots were sown on Dec 18. Untreated seeds, shown in the pot at the left, did not germinate until Jan 28, and then only 40% of them came through. Of the treated seeds in the flat at the right, 80% germinated between Jan. 8 and 10.*

America's Possibilities

Some of the drug houses are growing henbane for its leaves and others will no doubt increase the acreage to supply our needs. Stramonium can be produced easily enough *if* seed is available. In fact practically all of the drug products that we import could be grown somewhere in America. The temperate regions of the United States could take care of many of the herbaceous and woody plants native in central Europe, while in Central and South America we have the ideal regions where we could duplicate the crops of other tropical countries. We must not overlook the fact that cinchona (the source of quinine) and rubber are both American plants that have been transplanted to the oriental tropics. On the other hand, many drug supplies such as spices come from trees which take many years before they bear a crop, and such items are practically impossible to develop in a short space of time. It would have been wise, years ago, to have established small plantings of many of these useful trees wherever they would grow in the western hemisphere.

Oil-Bearing Crops

The drugs that yield essential oils are for the most part produced in other countries. However, the following substances could be produced in the Americas, though they would require considerable acreage. Such

* The details of the seed treatment will be presented in a technical paper when the chemical assays are completed.

plants are cumin—2,000 acres; coriander—4,500 acres; anise—25,000 acres. Dill, caraway and fennel would require some extra thousands of acres. The latest available information shows that in normal times Holland produced 16,000 acres of caraway seed; that Russia had 10,000 acres each for anise and fennel oil; and it is estimated that 30,000 acres were devoted to coriander. The total production of lavender oil in Europe would indicate that about 400,000 pounds of this oil are used, but it is now unobtainable in this country.

These are a few of the oil-bearing drugs that offer possibilities for culture in America, but only on large-scale operations. The crops demand extremely careful cultivation, for the mere trace of a foreign plant will result in undesirable substances, which will spoil the finished product. Such culture demands special machinery and industrial plants for the distillation of the oil. This represents a huge investment with which most individuals are unable to cope. On the other hand, we are producing a very excellent grade of dill seed oil in Ohio; while in Mexico a good quality of geranium oil has been produced. Both lemon and citronella oils are grown successfully in our own tropical islands. We are large producers of peppermint oil, from which menthol is obtained, but since supplies from Japan have in normal times augmented our output at home, it will be necessary to increase our acreage of peppermint. Oil-bearing crops are perhaps the most difficult ones to master because of the many technical skills that are required to furnish a fine product.

Insecticides Needed

If we are to preserve our crops from insects and our food supplies from rats we must produce some place in the Americas about 30,000 acres of drug-plants for these purposes. Derris root can no longer be imported from the Netherlands East Indies, and our supply of cubé and barbasco from South America normally supplied only half our needs. These two crops are mostly gathered from native stock in the tropics. A few plantations are known to exist, but the acreage will have to be considerably expanded to meet our present needs.

Chrysanthemum cinerariifolium and other species which are known in the trade as "insect flowers," are also used for sprays and dusting materials. There have been a few test plots grown in this country, and in our northern regions we can increase our yield if we have sufficient seeds for propagation. But that is a matter of uncertainty.

As red squill, a variety of *Urginea*, is used to kill rats, and we need a large amount of this material, so it is hoped that experiments now being conducted will result in methods for its propagation. Red squill normally came from the Mediterranean basin.

White squill, which also ordinarily came from the same region, is used to a considerable extent in medicine, and this drug is practically

off the market, but it is hoped that from the few living plants now growing here, sufficient seeds will be obtained to make us independent of other countries. The writer has more than 20 vigorous plants of white squill growing and they will no doubt produce enough seeds for the nucleus of our domestic needs.

* * *

How long the war will last is, of course, problematical. Judging from conditions after the last war it will be one to two years later before any normal relations will be established in crude drugs. Drug cargoes are bulky material and are designated in the shipping trade as "tea" cargoes. Shippers will only take such cargoes when no other commodity is available. Then, again, the scorched earth policy may prevent production for many years to come. It is the writer's opinion that normal trade relations will not be established for another seven years. Therefore, we shall have to produce some of the most needed items as well as we can. The great stumbling block is the inability to get seeds and plants for propagation.

It is obvious that we have very little literature available on drug cultivation. The best general information obtainable is that from the United States Department of Agriculture. Persons interested in drug culture should write directly to Washington for the bulletins available on this topic. Writing letters to botanical gardens, manufacturing drug houses, and crude drug houses results in merely directing attention to Washington. In general, in the region of metropolitan New York we have a large mass of our population who have small farms and summer homes with more or less land available. It is but natural that they should wish to produce a crop, either for defense work or with the idea of some profit. Such land in most cases has not been under cultivation for years and as such is not suitable for growing all drug plants. Drug culture demands well cultivated soil and freedom from weeds. The local county agricultural agent can inform anyone of the types of soil he may have. If seeds can be procured, a few rows as a test plot could be started for the first year. Any excessive expenditure for farm equipment for the cultivation of drugs is wholly unwarranted and interferes with defense activities. The entire problem of drug cultivation is one that is attended with many risks, and anyone engaged in this line of endeavor must be ready to face heavy losses upon his investment.

The article above is based on the address given by Dr. Bonisteel on the second day of the Conference on Herbs and Drug Plants at the New York Botanical Garden April 7 and 8. Other addresses, or excerpts from them, will appear in forthcoming Journals. At the close of his talk, Dr. Bonisteel exhibited a specimen of foxglove (Digitalis purpurea) which, he said, by biological assay has been proved to contain more than one and one-half times the normal amount of digitalis. The result of selection and breeding, this plant is an example of how our production of essential drugs can be increased by improvement in the plants from which they are derived.

Succulent Plants Of The Old World

By E. J. Alexander

(Fourth in a series of articles primarily based on the large collection of succulent plants at the New York Botanical Garden.)

THE similar response which many plants present to desert-like conditions has given rise to the widespread misconception that succulents are a separate family of plants. But actually they belong to many families. *Succulence is an alteration of plant form or growth caused by the great development of water-storage tissues in order that the plant concerned may survive under conditions of water-supply so meager as to be otherwise inimical to plant life.* This may take place in any family of plants, but it will be seen that each succulent plant still possesses the flowers and seed-producing organs characteristic of its family, only its vegetative structure having been altered. If there is any doubt as to the family of a plant of succulent character, it is better to refer to it merely as a succulent, which thereby implies a growth form, rather than as a cactus, which implies that it is a member of a particular family. There are, in fact, approximately 25 families in which some form of succulence exists, the fleshy members of 8 of which occur in both the Old and New Worlds, 4 in the New World only, and the remaining 13 only in the Old World. It is with this great group of Old World succulents that we are here concerned, and we find them scattered through 21 different plant families.

In a general survey of the succulent plants of the world, we note how few are the types of succulence produced as a response to an arid or semi-arid climate. As a matter of fact, there are only two: stem succulence and leaf succulence; as there are also only two resultant forms of growth: the rosette form and the stem-succulent form, the latter either with or without leaves.

In a possible third form the succulent portion is the much enlarged basal part of the stem, sometimes above ground, sometimes below. This is in reality a modification of the stem-succulent type, although when underground the fleshy portion of the stem is often tuber-like. Because plants in this group require the same conditions in cultivation as true succulents, the more remarkable ones will be mentioned here.

Succulent Lilies and Their Relatives

Among the monocotyledons we find leaf-succulence dominant with only three exceptions. One of these, *Cyanotis somaliensis*, is only half-succulent and therefore of no great concern here. Another is the elephant-foot, *Testudinaria elephantipes*, which consists of an enlarged food-storage body at the ground-surface. This body is covered with large, angled,

Gasteria with characteristically pebbled leaves and long flower spike. (¼)

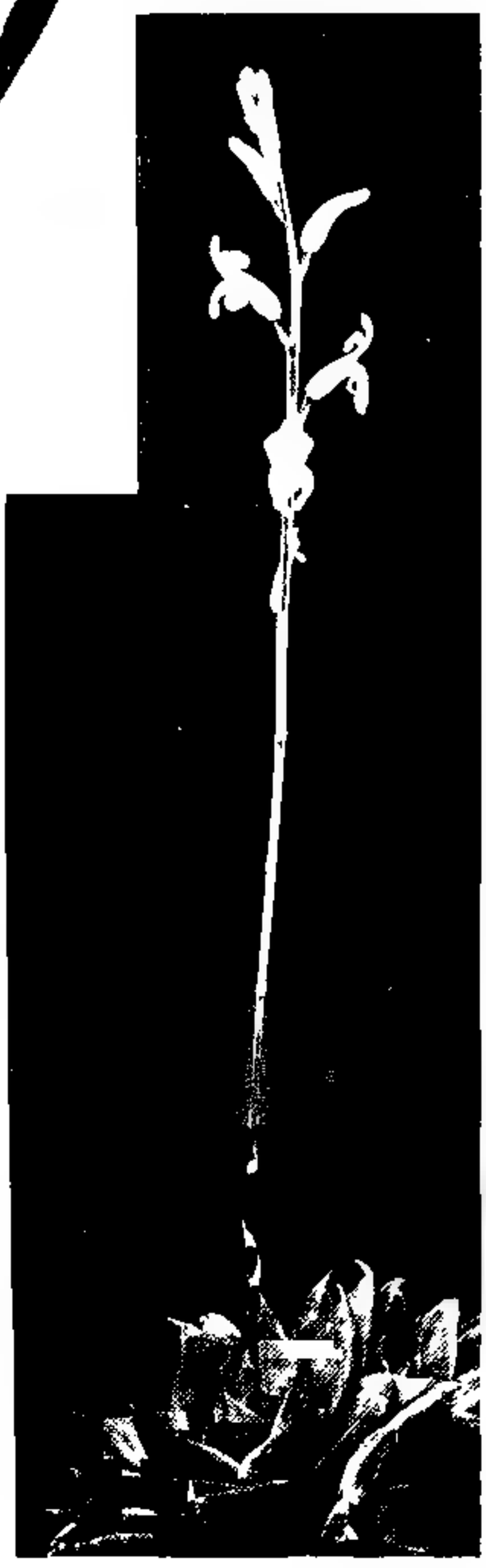
SUCCULENTS AMONG THE LILIES

(All reduced in size)

Aloe plicatilis, a distinctive form with two-ranked leaves. (⅛)

(Left) Aloe humilis, a popular dwarf species. (½)

(Right) Haworthia cymbiformis, showing the typical two-lipped flower of this genus. (½)



corky plates, the whole forming an unusual-appearing structure out of the center of which in growing season arises a twining stem which bears both leaves and flowers. The third exception is an asparagus relative, botanically known as *Schizobasopsis* (*Bowiea*) *volubilis*, which has, partly above ground-level, a large, round, pale green, bulb-like structure composed of many overlapping succulent scales. Out of the center arises a twining, intricately branched stem bearing at its ultimate tips small, six-petaled green flowers.

The crowning glory, however, of the succulent monocotyledons is the genus *Aloe* and its relatives, of which there are many hundreds of species. These plants are the eastern hemisphere counterparts of the Agaves of America, but belong to a different family, the Liliaceae, whereas the Agaves belong to the Amaryllidaceae. Their flowers are much more beautiful than are those of the Agaves, which are mostly greenish with a very few yellow or orange. The flowers of Aloes are in brilliant shades of red, orange, yellow, pink, and greenish-white, and the plants do not die after flowering, but continue to bear their torches of bloom each year. They vary in size from rosettes a few inches across to candelabrum-branched trees 30 or more feet tall. Some few have a sprawling habit of growth. Their leaves are in varying shades of green, frequently with yellowish streaks or blotches, and often coated with powdery white, giving a blue appearance. The leaf-margins are sometimes smooth, but usually they are armed with sharp spines, sometimes even on the under surface of the leaf. A group of some 10 or 12 species of *Aloe* differs markedly from the rest in having deciduous non-succulent leaves. Their flowers are as usual, but the plants are practically unknown in American horticulture.

Closely related to the Aloes are two little known genera, *Chamaealoe* and *Lomatophyllum*. These plants have less brightly colored flowers and are quite rare, but hardly worth great effort to grow.

Of great horticultural value, however, are three other related genera, which by reason of small, compact growth and ease of culture, are among the most choice and desirable of house-plants. They require nothing more than a little water, good drainage and soil, and some shade, and in return make splendid specimens that will stand almost any amount of neglect and the most dry and hot atmospheric conditions. The most closely related to the Aloes are the species of *Gasteria*, all of which have stiff, tongue-shaped leaves, usually with yellowish blotches or raised white warts. Their tubular flowers, inflated at the base, in shades of coral-pink or red, hang in arching racemes.

While the genera *Haworthia* and *Apicra* have greenish white flowers of no great beauty, they are all attractive small plants. Sometimes the leaves have white warts in rows on the under side, sometimes they are windowed with transparent streaks towards the tip, sometimes they are evenly colored, either dark or light, but they are always fascinating.

The flowers of *Haworthia* are irregular, the three upper petals being larger than the three lower ones; those of *Apicra* have the petals all alike.

In this relationship is one other genus, *Bulbine* with tender pale green leaves and spikes of bright yellow flowers whose petals are spread flat, exposing the bearded filaments of the stamens. They are not easy to grow and are mostly of botanical interest.

Though the species of *Sansevieria,* also in the Lily family, have succulent-textured leaves, most of them are jungle rather than desert plants.

The only members of the Amaryllis family among the Old World desert plants are the two species of *Doryanthes,* both from southeastern Australia and quite rare in cultivation.

In the Mulberry Family

Dorstenia, a genus of the Mulberry family, Moraceae, and distantly related to the figs, contains several succulent species, all from the same general geographical region. *D. foetida* from Yemen at the southwest tip of Arabia is one of the types of desert plants with tuberous-thickened stem base and a few short, soft branches. *D. crispa* from the Galla highlands of southern Abyssinia is a true succulent with long, crisp-margined leaves and a thick, unbranched stem. Most striking of all is *D. gigas* from the island of Socotra. It is a highly succulent shrub 2 to 6 feet tall, the stem smooth-skinned and strikingly obese, with candelabriform branches and long narrow leaves. All of these species have the typical inflorescence of the genus called a hypanthelium, which is a long-stalked, flattened, disk-like body, the surface covered with many tiny florets, the margin with several leaf-like appendages.

In the Portulaca family are two succulent genera. One, the elephant-bush, *Portulacaria afra,* said to be a favorite elephant food in Africa, is popular in succulent collections. It has wide-spreading branches and small, sparse, nearly round leaves, but its tiny pinkish flowers are rarely seen. Also in this family is the genus *Anacampseros,* the "windowed" members of which were mentioned in the preceding article. The other members, about 10 in number, are rosette-like plants with thick ovate or elliptical leaves and long-stalked, rosy-purple flowers opening for an hour or so in the afternoon.

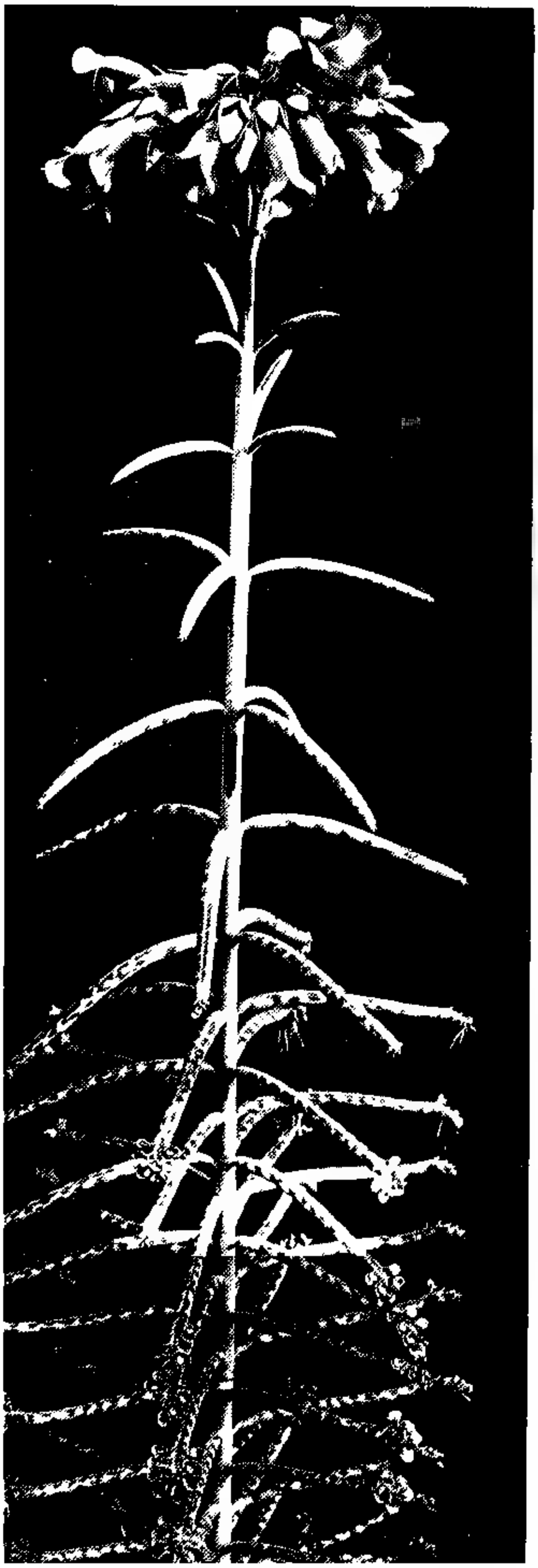
The Mesembryanthema

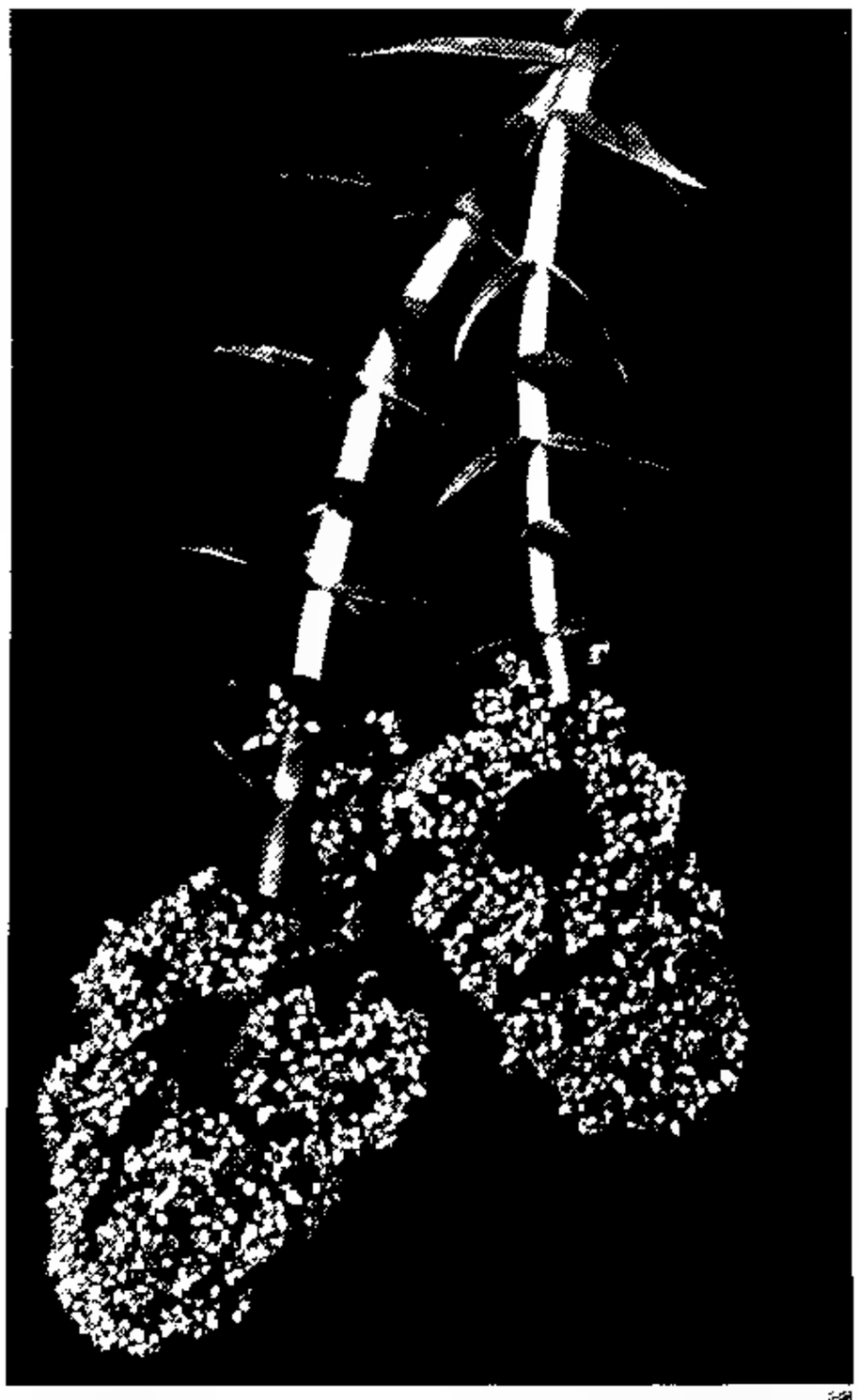
By far the greatest number of species of Old World succulents is in the old aggregate genus *Mesembryanthemum,* now broken into more than 150 genera and nearly all restricted to South Africa as their native home. Several species have escaped along the California coast, and one is considered native on the coast of Chile. The stone-mimicry and windowed members of this huge group of plants are so individually interesting as to have warranted a separate article. The remaining species (numbering

FLOWER AND LEAF FORMS IN THE CRASSULACEAE

(Reproduced approximately half natural size.)

Kalanchoë tubiflora, with plantlets on the tip of each leaf.





Crassula corymbulosa, whose pendent flow clusters have a heavy musky odor.

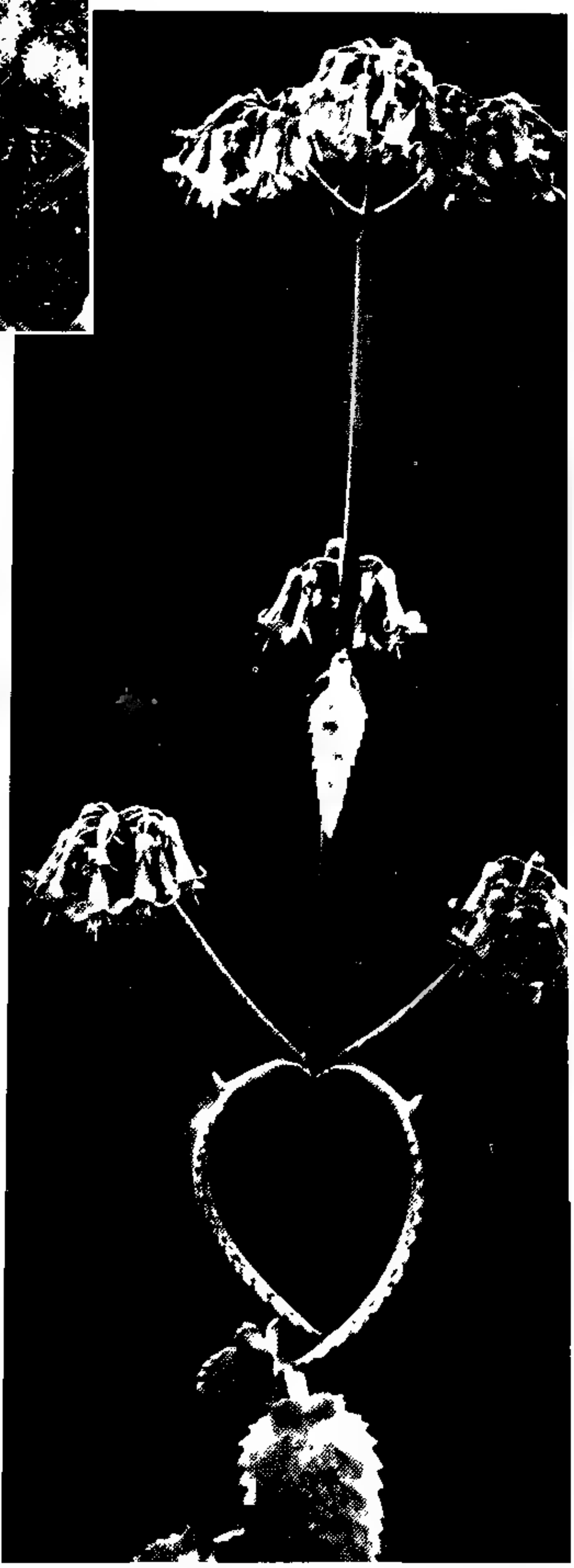
Kalanchoë marmorata, with white flowers

MORE FASHIONS

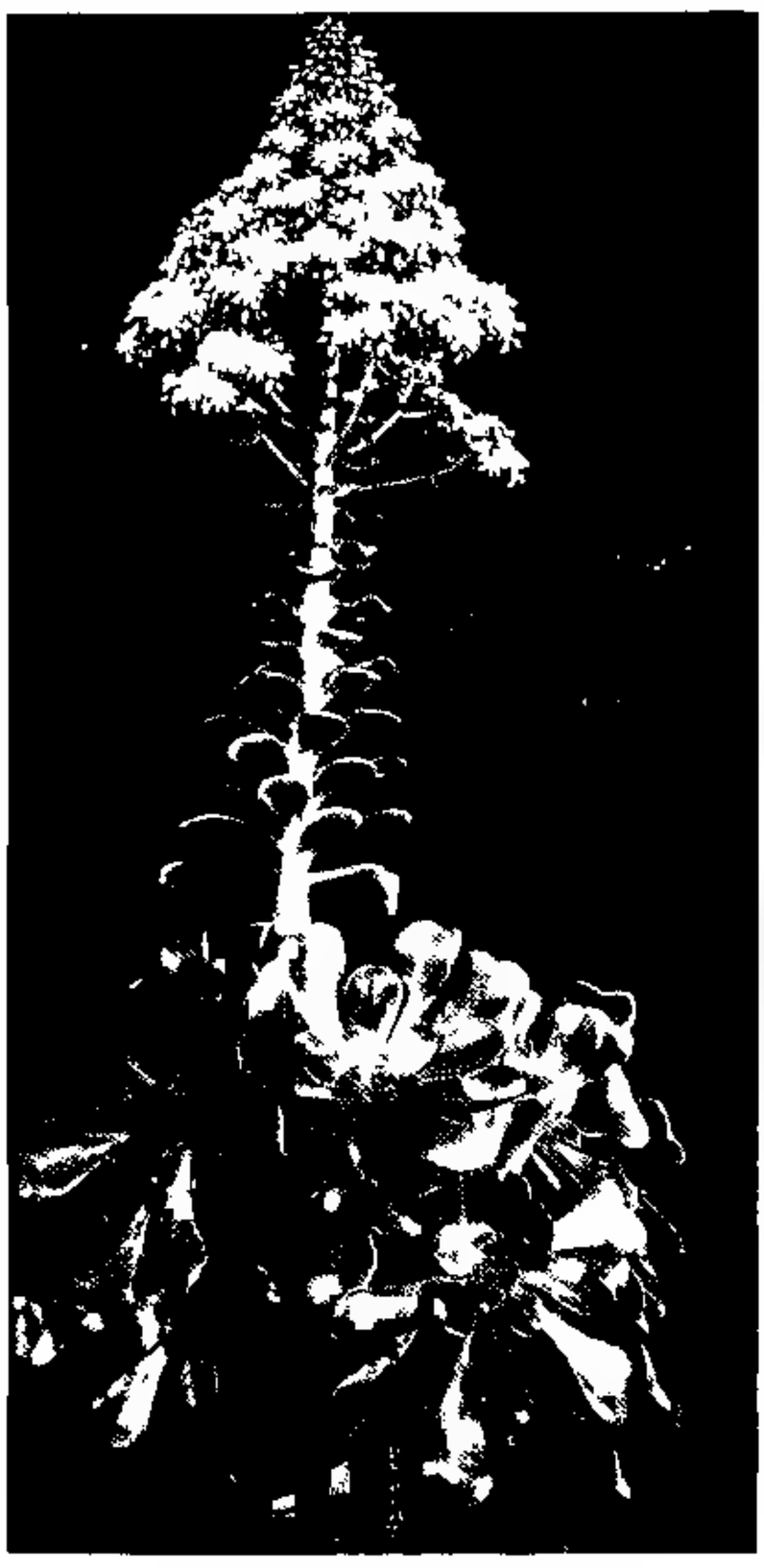
IN THE CRASSULA, OR

STONECROP, FAMILY

argentea (also known as C. portulacea), excellent plant for home culture.



Manriqueorum, which stands 3 feet high.



more than 2,000) must be treated through a group of their representatives here.

Stem succulence is quite rare in this group, which is either stemless and rosette-like, semi-woody and creeping, or erect and much branched with succulent or half-succulent leaves. All are sun-lovers and inhabitants of arid or semi-arid regions. Their flowers are many-petaled and bear such a striking resemblance to flowers of the Composite family that many amateurs (and, for that matter, many horticulturists) believe them to be members of that family. However, upon examination of the blossom, it will be seen that it is a single flower with calyx, corolla, stamens, pistils and ovary, not a head composed of a cluster of flowers as, in the Compositae. The Mesembryanthema belong to the Carpet-weed family, Aizoaceae, which is distantly related to the portulacas and is suspected of having some far distant, ancestral relations with the Cactaceae.

These plants, which go in for nearly every form of growth except that of a tree, are noted for the brilliancy and quantity of their glossy-petaled flowers, which are known in all colors except clear blue and in all sizes up to 4 inches across. Some of the most beautiful ones, while quite well known in the West, are little known and usually poorly grown in the East. Among the finest are *Drosanthemum speciosum,* of brilliant orange with green center; *Lampranthus coccineus,* with bright red flowers; *L. Zeyheri,* with flowers of tyrian purple; *L. spectabilis* and *L. emarginatus,* both with deep pink flowers; *L. aureus,* deep golden, and *L. Brownii,* whose flowers open burnt orange and slowly change to bright purple so that several colors are usually seen on the plant at the same time. *Cephalophyllum Alstonii* has deep blood-red flowers and *C. spongiosum* rose pink flowers, 3 or 4 inches across; *Carpobrotus edule,* large golden-yellow, and *C. acinaciformis* and *C. glaucescens,* large rose-purple flowers; and lastly *Hymenocyclus purpureocroceus* purple, yellow-centered flowers.

The familiar old garden annual called ice-plant is *Cryophytum crystallinum,* the name of ice-plant being given it on account of the transparent tubercles which look like particles of ice covering the entire plant. These ice-like tubercles are on many species among the Mesembryanthema, but are best developed on *Cryophytum.*

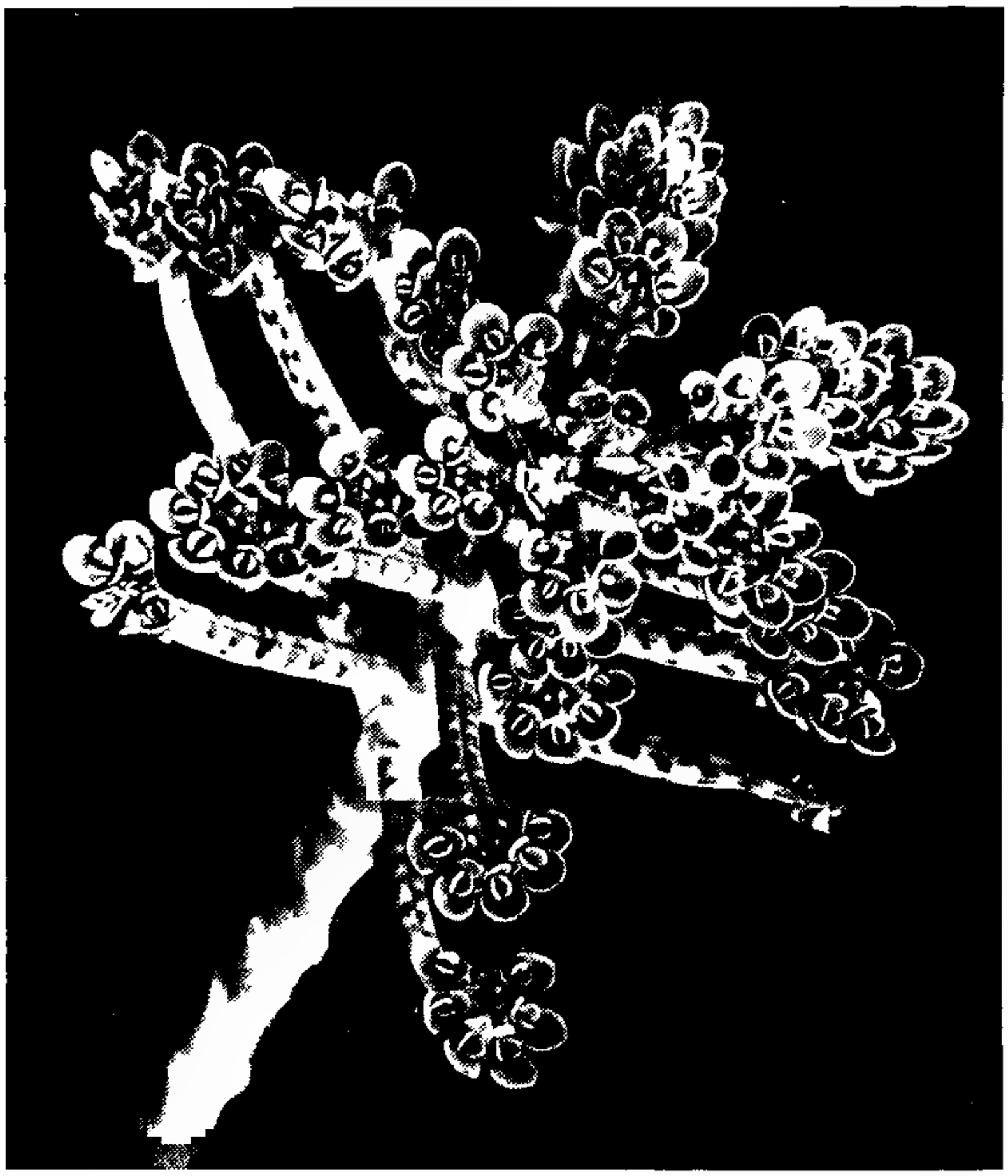
Oscularia caulescens and *O. deltoides* are two beautiful shrubby species with small blue leaves and numerous small pink flowers. *Dorotheanthus criniflorus* and *D. tricolor* are two annual species with attractive pink, red or purplish flowers with blue or white centers. The species of *Trichodiadema* are interesting because of the cactus-like cluster of spines at their leaf-tips—they are the only Mesembryanthema so constructed. We in the East might well become better acquainted with these plants, as they are suitable for summer bedding in hot dry situations and in gardens near the seashore.

The genus *Moringa,* which forms its own family Moringaceae, related to the capers and mustards, contains one half-succulent species, native in southwest Africa. It is a small tree up to 18 feet tall and 3 feet in diameter with smooth pale gray bark and soft spongy wood. The branches are thick and soft, the leaves bi-pinnate, slightly over 2 feet long and nearly 2 feet wide. The inflorescence is a much-branched, racemose panicle up to 20 inches long, with small white flowers.

Familiar Plants Among the Crassulas

Of equal importance is the family of the stonecrops, the Crassulaceae. We are all familiar with the rock-garden sedums and sempervivums, but the tender greenhouse kinds are more beautifully flowered, some of them being very popular as house plants. The genera here discussed are mostly restricted to South Africa and Madagascar, where they are the counterparts of the American genera *Echeveria, Dudleya, Pachyphytum,* and *Graptopetalum.* Probably the best known is the genus *Kalanchoë,* mainly by reason of the popular *K. Blossfeldiana* and the sprouting-leaf species *K. pinnatum, K. tubiflora* and *K. Daigremontiana.* The upright-flowered group are brilliant when in blossom, their red, yellow, orange, pink, and even white flowers borne in large, compact, somewhat flattened clusters. *K. Blossfeldiana, K. flammea* and *K. grandiflora* are the best known of this group, the last-named one being quite fragrant. The species with drooping flowers are also the ones with sprouting leaves. These, nearly all native of Madagascar, and the best known of which are named above, have flowers of yellow, orange, and smoky shades of mauve, purple and pink, all of them with prominent stripes of red, brown or purple. One of the most unique is the only climbing plant in the Stonecrop family, *K. scandens* with flowers of a peculiar smoky-gray-mauve. There is also a shrubby group with woolly leaves which are more spectacular as foliage plants than for their rarely produced flowers. The best known ones of these are *K. beharensis* with large, broadly arrow shaped leaves; *K. tomentosa* with narrow, gray, brown-edged leaves; and *K. orgyalis* with

Pygmy debut. These two minute members of the Crassulaceae have not previously been recorded in cultivation anywhere in the United States. At the left is Monanthes polyphylla from the Canary Islands; at the right, Crassula nemorosa from South Africa Both bloomed at the New York Botanical Garden early in 1940.



Half a dozen young plants are seen at the tip of nearly every one of the mottled tubular leaves of Kalanchoë tubiflora For a view of the plant in flower, see page 100.

roundish, rusty-brown foliage. Many of the Kalanchoës have leaves which are beautifully mottled with purple streaks or blotches, many others are plain green or grayish. The closely related genus *Kitchingia* is very similar, but contains a variation in a beautiful basket-plant, *K. uniflora*.

The species of *Cotyledon*, not so well known, are nearly all shrubby. Many have large green or whitened leaves, sometimes with red margins; others have narrow green leaves, and one group has short-lived leaves and highly succulent stems. All have clusters of large, drooping, tubular flowers, red, orange, yellow, pink or white in color.

The genus *Crassula* contains a large number of plants of widely differing

growth—creeping, prostrate, clustered, shrubby, some even moss-like and others stone-mimickers. Their flowers, individually small, are heavily musk-scented, and are borne in large clusters as varying in form as are their growth-habits, the great majority of them greenish, but there are enough red, pink, yellow and white ones to satisfy. The handsomest among these are *C. falcata* with wide, flattened and curved leaves and *C. perfoliata* with thick, straight, pointed leaves; both have large heads of bright scarlet flowers. The best known of all the Crassulas, however, is the one sold by florists throughout the United States as jade-plant, Mexican rubber-plant, Chinese rubber plant, and many other equally misleading names. Even the botanical name has been confused, since this plant is frequently miscalled *Crassula arborescens,* a name which belongs to a quite different plant with larger, gray, red-margined leaves. The correct name has for many years been *Crassula portulacea,* but the name-jugglers have been busy and as a result this much bandied-around plant now bears the name of *Crassula argentea.* Needless to say, it is native of South Africa, not of either Mexico or China, and certainly it is known not to be a rubber-plant. Nevertheless it is a good tough house plant and quite attractive when covered with its star-like, white, pink-centered flowers.

The species of *Adromischus* are attractive, small, rosette-forming plants, their leaves quite thick and fleshy, usually with purplish blotches. Their flowers are white or pinkish, and are borne in a tall, slender, unbranched raceme.

The related genus *Rochea* is noted mostly for its fragrant, long-tubular flowers, rich red in *R. coccinea* and white in *R. odoratissima,* the foliage being rather unattractive. The pink-flowered species do not appear as yet to have reached American gardens.

We cannot leave the Crassulaceae without mention of the shrubby sempervivums of the Canary Islands, botanically called *Aeonium,* with their leaves in large rosettes often of dinner-plate size and their foot-long pyramids of blossoms. One species, *A. nobile,* has a head of bloom 18 to 20 inches across, the flowers dark red instead of the usual yellow or greenish-white. There are also several small-growing species more similar in appearance to the rock-garden sempervivums.

Also from the Canary Islands are the two genera *Aichryson* and *Greenovia.* They are golden flowered, the species of *Aichryson* mostly annual or biennial with wide-branching stems and hairy leaves, the species of *Greenovia* with smooth leaves in tight stemless rosettes which in the resting stage appear like green rosebuds.

The final word on the Crassulaceae needs to be said for the genus *Monanthes,* also from the Canary Islands. There are about 10 species, sedum-like in appearance with slender-stalked peculiarly constructed flowers of pink, yellow, brownish or greenish shades.

Plant or animal? The snake-like form of Crassula pyramidalis makes it a plant oddity of the first order. It is seldom seen in bloom and is known as a difficult subject to grow in eastern greenhouses.

Tones of salmon-pink are blended in the pendent flowers of Kitchingia peltata, a newly introduced and easily grown member of the Crassulaceae.

Geraniums from Desert Regions

The succulent-stemmed members of the Geranium family are little known to horticulture except for one or two species of *Pelargonium*. *P tetragonum*, the best known, is a sprawling plant with 4-angled fleshy stems and typical geranium leaves. Its two lipped, pink and white flowers are borne in pairs on stalks from the leaf-axils. The half-succulent *P echinatum* is equally well known. The fully succulent species with large, swollen stems and deciduous leaves are but occasionally seen in specialists' collections. They are difficult to grow and not likely to become popular. The New York Botanical Garden has five or six of these succulent species in its collection, the most outstanding ones being *P paradoxum, P carnosum* and *P. crithmifolium*, all with pale bluish green, deeply cut leaves and small flowers. There is one other genus with succulent species

in the Geranium family, *Sarcocaulon,* with wide-spreading, thick, fleshy and spiny branches, with roundish, ovate or finely cut leaves, and with pink or white flowers that look more like mallows than like geraniums. They are among the most difficult of succulents to grow, and are therefore not to be considered as popular horticultural subjects.

The Caltrop family, Zygophyllaceae, contains an interesting succulent, *Zygophyllum Fontanesii* from the Canary Islands. This is an odd-appearing, bushy plant with spreading branches and thick, club-shaped leaves. There are other succulent-leaved Zygophyllums in Egypt and South Africa. From the latter place also comes another bushy succulent of the same family, *Augea capensis.*

This article will be continued in the next number of the Journal, and with it will appear additional illustrations depicting plants that have been mentioned this month. The photographs are by the author, by Fleda Griffith, Staff Photographer, and by Samuel Seigel of the Work Projects Administration.

Ching Tsai, A New Chinese Vegetable

The exhibit at the International Flower Show last month of a dozen specimens of *Moricandia sonchifolia* gave the American public its first glimpse of a Chinese vegetable that has never before been cultivated in this country. These plants, in fact, were raised for greenhouse decoration rather than for food; but if extensively cultivated the species would provide a new leafy vegetable for the American table. In its native land the leaves are eaten either raw or cooked.

Belonging to the Cruciferae, the species is characterized by attractive four-petaled violet-blue flowers more than an inch across arranged in a loose, erect raceme. The leaves are bluish. The plants displayed were raised from material brought a few years ago from the Royal Botanic Gardens at Kew, England.

"Ching Tsai" is the name that has been given to this new food plant. Translated, it means "green vegetable." As the original Chinese name for the plant could not be found, it was christened "Ching Tsai" by Dr. Roberta Ma, a member of Dr. Robbins' laboratory staff.

Art Exhibits

INDIVIDUAL wild flowers ten times enlarged will be shown in an exhibit of the work of Miss Florence Murdoch in the Museum Building at the Botanical Garden for several weeks beginning April 24. Miss Murdoch has drawn each flower in great detail. Her subjects include the bishop's cap, jewel-weed, ground-nut, coral-root, bladderwort, butterfly weed, and other familiar native plants.

Beginning a week later, there will also be at the Garden an exhibit of color proofs showing 25 "Trees of the Countryside" which are being used in a book by that name being published about May 1 by Knopf. The paintings were made by Miss Alice Bird of Rye, N. Y. Margaret McKenny has written the text.

Edible Weeds Of Wayside And Woods

By Helen M. Fox

IN the days when the coastal lands of North America and, later, lands to the west were the frontiers of Europe, the explorers, hunters and early settlers, when they needed food, tried whatever plants had a familiar look to them. Some, such as wild garlic and lamb's quarters, closely resembled related species which they had known at home. Nettles and dandelions became established from Europe so early that they soon became common weeds of roadsides and fields, and in their young stages they were added to the newcomers' diet. Plants that were unfamiliar the white man learned about from the Indian.

Only a few of these wildlings are eaten today, for as soon as the land became cultivated and sown with seeds of familiar plants from Europe, the settlers returned to the food habits of their ancestors, except for the addition of such notable American vegetables as Indian corn, the large group of indigenous squashes, and the almost equally large numbers of indigenous beans, native further to the south but cultivated by the North American Indians. While the "Jerusalem" artichoke of North America was carried to Europe by some of the first returning travelers, it never gained popularity as a crop plant among the early settlers. In fact, it is probably more in use today than at any previous period.

Many of the edible plants that have come to be known as weeds might well be adopted again as an adjunct to the diet, both for their novelty and their nourishing qualities, particularly if some of our common market foods should become scarce.

Wild Onions and Beans

Among the earliest greens in the woods and meadows in spring are the spears of the various wild onions. From New Brunswick to Texas the wild garlic (*Allium canadense*) is native. It eventually grows a foot high and has clusters of pink or white flowers atop its stems. Bulbs of this onion were eaten by the Indians. So were those of the wild leek (*Allium tricoccum*), which grows in rich woodlands from New Brunswick west to Minnesota and south to North Carolina, its loose umbels of white flowers appearing long after the leaves are gone. Sturtevant, in his "Notes on Edible Plants," tells how the bulbs of *Allium cernuum* a decorative onion with dainty nodding umbels of pink flowers—formed, with the bulbs of *A. canadense*, almost the entire source of food for Marquette and his party on their journey from Green Bay to the site of the present city of Chicago in 1674. Oliver Perry Medsger in his book, "Edible Wild Plants," says the bulb of *Allium cernuum* has an agreeable taste

after being boiled and that bits of the leaves are pleasant in soup or with vegetables.

All early explorers speak of *Apios tuberosa,* the groundnut or wild bean, called PENACS by Canadians and HOPNIS, also OPENAUK, by eastern tribes. Asa Gray, great American botanist of the 19th century, wrote of it:—

"Had civilization started in America instead of Asia our ground nut would have been the first developed esculent tuber and would probably have held its place in the first rank along with potatoes of later acquisition."

The tubers grow slowly and require two years before being large enough to harvest. Since they creep and spread underground, collecting them is reported difficult. They are said to have a taste similar to potatoes and to be starchy and nutritious. The groundnut is a vine of the Pea family. Pinnate leaves and pea-like fragrant flowers borne in short racemes grow on the twining stems. It is found in light woods throughout the eastern half of the country.

A Western Food Plant

Among the early travelers who wrote accounts of edible plants were Captains Meriwether Lewis and William Clark, while on the expedition authorized in 1803 by Jefferson to explore the newly acquired territory of the Louisiana Purchase. Lewis had been instructed by Jefferson, whose neighbor and secretary he had been, to "note the food plants of the Indians and the dates at which the particular plants put forth flowers and leaves." Then in 1843, Lieutenant John Charles Fremont wrote a report on an expedition of the country lying between the Missouri River and the Rocky Mountains. All three explorers mention *Psoralea esculenta,* called POMME DE PRAIRIE and POMME BLANCHE by Canadian explorers and prairie turnip, potato or apple, also Indian breadroot. Lewis wrote—

"At the confluence of the Yellowstone and Missouri, Captain Clark . dug up large quantities of a large very insipid root called by the Indians, Hankee and by the voyageurs White Apple. It is used by them in a dry and powdered state but our men boiled it and ate it with their meat."

Fremont said the Sioux used the roots extensively, first cutting them into slices and drying them either in the sun or over a slow fire, then pounding them into a meal. Others report the Indians ate the roots raw after peeling them, but they always saved some of the crop for storing. Indian women sold the roots to caravans trekking across the western plains in their prairie wagons hooded with rounded white covers. *Psoralea esculenta* is native from Saskatchewan to Montana. It is a perennial lupine-like plant with turnip shaped roots which, according to Havard, contain 70% starch, 9% nitrogenous substances, and 5% sugar.

Spring Greens of Many Kinds

Travelers are more likely to try shoots new to them than to hunt for

edible roots. Kalm wrote of the common milkweed (*Asclepias syriaca*): ". . . as the French call it, le Cotonier, grows abundant in the country, on the sides of hills which ly near rivers and other situations as well in a dry and open place in the woods, as in a rich, loose soil. When the stalk is cut or broken it emits a lactescent juice, and for this reason the plant is reckoned in some degree poisonous. The French in Canada nevertheless use its tender shoots in spring, preparing them like asparagus; and the use of them is not attended with any bad consequences, as the slender shoots have not yet had time to suck up anything poisonous. . . The French in Canada make a sugar of the flowers which for that purpose are gathered in the morning when they are covered all over with dew. This dew is expressed and by boiling yields a very good brown palatable sugar. The pods of this plant when ripe contain a kind of wool, which encloses the seed, and resembles cotton, from whence the plant has got its French name. The poor collect it, and fill their beds, especially their children's, with it instead of feathers."

In the spring of 1940, a vegetable new to New York City, called fiddlehead greens, arrived from Maine in barrels. These greens are the tightly curled young shoots of two species of *Osmunda*, the cinnamon and the interrupted ferns. In the West, the young stipe, or "stalk," of the brake or bracken (*Pteridium aquilinum*) is eaten. Cooked in salted water until tender and then drained and served with butter, salt and pepper, these stalks have a pleasant and distinctive taste. Charles Francis Saunders in his book "Useful Wild Plants" quotes Washington State University as authority that their food value is similar to that of cabbage, which is exceedingly high.

Parts of the bracken, as might be expected from its wide geographical distribution in North America, Europe and Asia, have been eaten over a long period of time and by many different people. Von Humboldt reported that the people of Palma in the Azores and in Gomera, one of the Canary Islands, ground the roots to a powder, mixed them with barley meal, and boiled this, which they called GOFIO. In Vancouver Island and neighboring lands, Indians gathered the rhizome of this fern and made bread of it, as did the French in Normandy (but only in time of famine). The Canadians also eat the shoots, which they call "fougères poussées." The rhizomes are a component of beer in Siberia, and Thunberg reported that the Japanese ate the young shoots in soups.

An abundant native weed is the showy perennial pokeweed, other popular names of which include Virginia poke, pigeon-berries, garget, jalap, cancer-jalap, scoke, coakum, and American nightshade. Young shoots with deeply veined elliptic-lanceolate leaves are often weeded out of the flower border, but instead of being thrown on the compost heap, they could be cooked and eaten. In pasture lands and open places in woods from Maine to Mexico, pokeweed raises its reddish stems sometimes to twelve feet high. The tiny flowers, white fading to purple, arranged in racemes, are followed by poisonous black-purple fruits on crimson stalks. The turnip-like root is also dangerous, but the very young shoots are safe. William P. C. Barton, nineteenth-century botanist and physician of Philadelphia, wrote of pokeweed in his Medical Botany of 1818:

"The turiones (suckers or shoots) of this plant are cut near the ground when about three or four inches high, and brought in great abundance to the Philadelphia market, as a table vegetable. . . . When well boiled and dressed in the same manner as asparagus, they are easily digested."

One of the most striking and colorful of early spring flowers is the marsh-marigold, *Caltha palustris.* Fortunately for its preservation it grows in swampy ground that is generally inaccessible. In many parts of the country the kidney-shaped leaves and hollow stems are boiled for a potherb. In the South the buds of the yellow buttercup-like flowers are pickled and substituted for capers. Oliver Medsger gives a recipe for creaming the leaves and stems which he says was given him by a countrywoman. He writes:

"Cook the cowslips, add salt, drain well and chop fine. Put a tablespoon of butter into a saucepan, add a tablespoon of flour and mix thoroughly. Salt and pepper to taste. Add greens and one half a cup of cream or rich milk. Stir until well mixed and you have an appetizing dish ready to serve."

Why it is that most children dislike cooked greens is hard to tell. In recent diets made up by experts the importance of cooked greens are emphasized and their value explained. With the addition either of a little nutmeg, rosemary, mint or summer savory, a bland and uninteresting vegetable can be transformed into a Lucullian dish.

There are three common weeds which furnish spinach-like greens—the nettle (*Urtica dioica*), pigweed (*Amaranthus retroflexus*), and another pigweed (*Chenopodium album*), which is also called lamb's quarters, baconweed, white-fat-hen, mealweed, and frost-blite. Peter Kalm says of the lamb's quarters:

"The *Chenopodium album,* or Goosefoot with sinuated leaves, grows in plenty in the gardens, but is more scarce near the houses, in the streets, on dunghills and cornfields. This seems to shew, that it is not a native of America but has been brought over amongst other seeds from Europe."*

One of the five herbs eaten by Jews at Passover is the nettle. It has been cooked as a potherb and used in soup since earliest days, also used in puddings composed of meat and vegetables, made into beer and brewed as a tea. Bois wrote that it was sold in Russian and French markets before the first World War. On this continent, American Indians ate the native species. In England, in the seventeenth century, Mr. Pepys in his famous diary wrote that he called on Mr. Simons. The gentleman was abroad, but his wife, who was at home, served them a porridge of nettles which was very good. His contemporary, John Evelyn, says of nettles:

". . . Hot, dry, *Diuretic, Solvent*; purifies the Blood: The Buds and very tender *Cimae*, a little bruised are by some eaten raw, by others boil'd, especially in *Spring-pottage* with other Herbs."

Rosemary and sage were thought to be antidotes for the sting, which was considered a cure for rheumatism. During cooking, the stinging principle evaporates from the spines of the nettle.

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* By some authorities today *Chenopodium album* is thought to be a pantemperate species, native in America as well as Europe.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Vegetable Text for Beginners

VEGETABLE GROWING. J E. Knott 356 pages, illustrated, indexed Lea & Febiger, Philadelphia Third edition, 1941. $3.50

For beginning classes in vegetable gardening, I have used Mr. Knott's text for six years and find it an excellent presentation of the fundamentals, though it does not place enough emphasis on the importance of the economic and the managerial phases of the vegetable growing business to make it a good text book for advanced classes.

This third edition has been revised and brought up to date on such matters as methods of applying fertilizer, the new portable, whirling-head equipment for irrigation, the latest recommendations on seed treatment, and insect and disease control.

The cultural directions for growing the different crops are quite brief. Instead of the experimental data usually found in text books of this nature, Mr Knott has placed at the end of each chapter a list of books and bulletins for suggested reading –a desirable addition.

Each illustration is clear and timely—as good as any I have ever seen in a vegetable text book.

WM. V. CUTLER.
State Institute of Agriculture on Long Island.

Seventeenth Edition

THE MICROSCOPE. Simon Henry Gage 517 pages, illustrated indexed Comstock Publishing Co, Ithaca, New edition, 1941 $4.

This is the seventeenth edition of a standard work of microscopic manipulation. If more users of the microscope would master this book, they would understand their instrument, see more than they ever did before, and would find their work less trying upon the imagination.

F. W. KAVANAGH.

Miscellany of Brief Reviews And Notes

In Old Virginia

THOMAS JEFFERSON'S FLOWER GARDEN AT MONTICELLO. Edwin M. Betts and Hazlehurst B Perkins 56 pages, illustrated The Dietz Press, Richmond, Virginia, 1941 $2.

Through the Garden Club of Virginia the flower garden of Jefferson at Monticello has recently been restored. This volume gives pertinent quotations from his diary and letters, and shows the plans for his gardens, nurseries, and greenhouses. A list of some 300 plants grown by Jefferson is included toward the end.

WILLIAM BYRD'S NATURAL HISTORY OF VIRGINIA. William J Beatty and Richmond Croom Mulloy. 109 pages. Dietz Press, Richmond, Virginia, 1940. $4.

When William Byrd, in 1736, planned to sell his property to satisfy creditors for a debt he had assumed, he attempted to interest a colony of "Switzers" in settling there. Accordingly he wrote a "Natural History of Virginia" which was translated for them into German. The original is no longer known, but one copy of the translation exists in the Library of Congress. Messrs. Beatty and Mulloy have put it back into English for the delectation of the 20th century reader. "Land of Eden" he called his place, and his descriptions of the trees, fruits, grains, birds, fish, and mammals make the name seem appropriate.

Nature Study

A LOT OF INSECTS. Frank E Lutz 304 pages, illustrated, indexed. G P. Putnam's Sons, New York, 1941. $3.

An entertaining series of stories on insect life, based on the 1,402 species of insects that the author found over a period of years in the suburban lot surrounding his home. The lot, incidentally, contained a garden where prize-winning flow-

ers were grown, so the relationship of insects to plants plays an important role in the book.

Gardening

1001 GARDEN QUESTIONS ANSWERED. Alfred Carl Hottes. 388 pages, illustrated, indexed. A. T. De La Mare Co., New York. Third edition, 1941. $2.50.

The thousand and one garden questions of previous editions have been increased to 1,309, and the book has been extensively revised and entirely reset. Answers vary from three lines to several pages in length. The questions, which have been largely compiled from questions asked the editors of *Better Homes And Gardens*, run all the way from "What Is Mendelism?" to "What vegetables, fruits, shrubs, and flowers shall we plant on a lot 55 x 125 feet?" Two pages on "What are the causes of winter injury?" are quoted from Henry Teuscher in the Journal of the New York Botanical Garden. Many amateur gardeners find this an indispensable handbook to guide their gardening activities.

GARDENER'S HANDBOOK. L. H. Bailey. 292 pages, illustrated. The Macmillan Company, New York. New edition, 1941. $1.49.

A simple, straightforward, authoritative handbook for the average gardener, attractively printed and reasonably priced in its new edition. The illustrations are well done. While botanical names are not lacking, enough common names are included to satisfy anyone who is afraid of such words as *Eschscholzia* and *Chionodoxa*.

THE EMBATTLED MALE IN THE GARDEN. Dwight Farnham. 249 pages, illustrated. Charles Scribner's Sons, New York, 1941. $2.50

A personal and occasionally amusing story of gardening "by marital pairs" on a Connecticut farm.

Industry

SUGAR AND THE EVERGLADES. United States Sugar Corporation. 67 pages, illustrated. Press of Benj. H. Tyrrel, New York, 1941. Gratis.

A booklet prepared as a memento for visitors to the largest sugar house in the United States, at Clewiston, Florida, giving a brief description of a trip through the Everglades, the story of sugar production, and an outline of social and economic conditions surrounding the industry.

Galls

PLANT GALLS AND GALL MAKERS. Ephraim Porter Felt. 364 pages, bibliography, illustrations, index. Comstock Publishing Co., Ithaca, N. Y., 1940. $4.

A guide to the wasps, midges, aphids, other insects, mites, and fungi that produce galls on plants. Nearly 300 kinds of plants affected by galls are tabulated, and about 1,800 causative insects and mites, but only the most important of these are described. The illustrations are excellent and the index has the specific as well as generic and common names of the gall-makers alphabetized.

Forestry

HARVARD FOREST MODELS. Harvard Forest. 48 pages, illustrated. Cornwall Press, Inc., Cornwall, New York, 1941. $.50.

Illustrations and descriptions are given of the three series of models of New England forests which are on view in the museum in the Harvard Forest at Petersham, Mass. They depict the history of the central New England forests, silvicultural practices developed at Petersham, and allied functions of forestry, such as wildlife management. The final illustration shows the construction of a model.

Famous Letters

THE NATURAL HISTORY OF SELBORNE. Gilbert White. 256 pages, illustrated, indexed. Penguin Books, New York, 1941. 25c.

An inexpensive reprint of the famous letters written during the late 18th century by the Rev. Gilbert White. Appropriately illustrated with woodcuts by Clare Leighton.

Museum Workers' Bible

FIELD MANUAL FOR MUSEUMS. Ned F. Burns. 476 pages, illustrated, indexed. United States Printing Office, Washington, D. C. 70c.

All the ramifications of managing a museum in a National Park seem to be included in this handbook, which has been prepared by the Chief of the Museum Division of the National Park Service. Such diversified subjects as methods of cleaning exhibits and how to arrange a study room in a museum are treated; also administrative procedure for the planning of activities, technique of mounting displays, and the management of park libraries and historic houses are included.

Current Literature At a Glance*

Dawn Patrol. The most effective time to apply protective dusts to plants is from dawn to about 7 a.m., according to a recent *Report of Progress* received from the Connecticut Agricultural Experiment Station at New Haven. The next best time is at night, even if lights are necessary, because then too there is dew on the plants and little wind in the air.

Weeds and More Weeds. Black-and-white illustrations of every weed that is mentioned and abundant notes on the control of these plant pests of farms and gardens are contained in three recent bulletins. "Representative Missouri Weeds and their Control" by W. B. Drew and C. A. Helm, is published at Columbia, Mo., by the Agricultural Experiment Station, and "Farm Weeds: Their Importance and Control" by A. B. Massey, comes from the Virginia Polytechnic Institute at Blacksburg.

Every weed is illustrated in the seedling stage as well as in bloom in "Weeds in Kansas" by Frank C. Gates, published by the Kansas State Board of Agriculture. Descriptions are given of 380 weeds.

Guild Gardener. Extra copies of a special American issue (the February number) of *The Guild Gardener*, official organ of the National Gardens Guild, have been sent to the Botanical Garden for distribution among garden clubs in this country that would like to help in promoting friendships between garden lovers in America and England. Edited by Lady Seton, *The Guild Gardener* contains in this number a statement from Queen Mary as Patroness of the Guild and a prose rhapsody on American wild flowers and gardens by the author, Marion Cran.

Fern Books. Reprints of the useful bibliography on ferns entitled "State and Local Fern Floras of the United States" by S. F. Blake have recently been received. The bibliography originally appeared in two numbers of the *American Fern Journal*. Each state is treated separately, and authors are listed in alphabetical order. A comment citing the scope of each work is included in the listing, which contains about 150 major references.

Anniversary. Another recent fern reprint is "The American Fern Journal Through Thirty Years" by one of the editors, Ralph C. Benedict. The American Fern Society has grown steadily in membership, and the 1941 volume of its Journal had the largest pagination in its history.

* All publications mentioned here—and many others may be found in the Library of The Botanical Garden, in the Museum Building.

Notes, News, and Comment

Gardening Courses. Approximately 500 people attended each of the two free series of lectures on Victory Vegetable Gardening given by the New York Botanical Garden in cooperation with the New York Times on six Wednesday afternoons and evenings beginning January 29 in the New York Times Hall on West 44th Street. The opening lecture, which was given by T. H. Everett on "Choice of Site, General Planning and Soil Preparation of Vegetable Garden" was preceded both afternoon and evening by an address by E. L. D. Seymour, representing the "Garden for Victory" program of United States Department of Agriculture. The subsequent speakers were James S. Jack on "Methods of Planting and Seed Sowing," George H Gillies on "Summer Care of the Vegetable Garden," James B. Jack on "Cultural Directions for Root Crops," Arthur King on "Cultural Directions for Leafy Vegetables," and John Watts on "Cultural Directions for Fruit-Vegetables." Each program was opened with an introduction by F. F. Rockwell, Garden Editor of the *Times*. Reprints of the six lectures are available from the *Times* for 25 cents.

Short Course. Twenty-eight students registered for the Three-day Short Course in Vegetable Gardening, which was given March 30 and 31 and Apr. 1 as part of the New York Botanical Garden's Victory Program in Vegetable Gardening. Presented under the direction of T. H. Everett, the course was taught by a group of seven professional gardeners: Edwin Beckett, George H. Gillies, James B. Jack, Thomas Little, Francis Paterson, James G. Esson, and John Watts.

Staff Change. Dr. H. N. Moldenke, Associate Curator, left the Garden March

19 for the Civilian Public Service Camp at Fresno, Ohio, where he is doing herbarium work in a soil conservation project. Dr. Ralph R. Stewart, who has been spending his sabbatical year from Gordon College in India working on the flora of India at the New York Botanical Garden, will serve as Acting Curator in Dr. Moldenke's place.

Lectures. Recent talks presented by staff members include the following:

By **Dr. William J. Robbins**—"Growth Substances" before the Plant Science Club of Yale University March 9, and a progress report on studies of the relation of vitamins to plants before the Botany Colloquium at Columbia University March 10.

By **Dr. H. N. Moldenke**—"A Naturalist in Florida" before the Roselle Park Nature Club February 28, and "Marvels in Adaptation Among our Local Plants" before the Fortnightly Club of Summit, N. J., March 13.

By **T. H. Everett** "Plants for House and Sunroom" before the Rusticus Garden Club, Katonah, January 12, "Planting the Vegetable Garden" before the Darien Garden Club Feb 25; "Seed Sowing, Planting, Coldframes and Hotbeds for the Vegetable Garden" before the American Women's Voluntary Services, March 4, and "Choice of Site, General Planning and Soil Preparation of Vegetable Garden" before the following organizations: Dutchess County Horticultural Society, Poughkeepsie, Feb. 10, Federated Garden Clubs of Connecticut at New Haven, also at Stamford, Mar 3, and at Hartford, Mar 6 and the Women's Club Gardeners, Darie , Conn Mar 11.

By **P. J McKenna** "Groundwork for Victory" before the Men's Garden Club of New York, Jan. 8.

By **Elizabeth C Hall** "Garden Books, Old and New" before the Smithtown Garden Club of Long Island, Feb. 3

By **Dr. H. W. Rickett**—"Gardens of Cloister and Castle" before the Flushing Garden Club, Jan 26.

Radio. G. L. Wittrock was interviewed by Nancy Boothe Craig over WJZ March 12 on the food and drug plants of the North American Indian. On February 17, T. H. Everett was interviewed by the actress Helen Twelvetrees over WMCA on victory gardens.

Motion Picture. Dr. A. B. Stout presented the Garden's motion picture in Hartford the evening of Feb. 13 to the Connecticut Horticultural Society, an affiliate of the Botanical Garden. On Feb. 15, Miss Fleda Griffith showed the film at the Methodist Church in Leonia, N. J. Dr. William J. Robbins took the picture to Lancaster, Pa., on Feb. 26 and presented it before the Lancaster branch of the American Association for the Advancement of Science On March 9, he presented the film before the Spring Glen Garden Club at Hamden, Conn., and on April 2 before the Washington Botanical Society in the National Capital.

New York Film. A motion picture in color entitled "New York Calling" produced by the New York Central System contains several scenes showing the rock garden and the irises in full bloom in the spring at the New York Botanical Garden. The New York Central plans to show the picture to clubs, churches, students, and civic and social organizations.

Torrey Club. Norma E. Pfeiffer of the Boyce Thompson Institute addressed the Torrey Botanical Club in the Members' Room at the Garden Feb. 18 on "Experiments in Connection with Lily Breeding," and E. P. Imle, also of the Boyce Thompson, spoke on "Bulb Diseases of Lilies." Tea was served after the two talks.

Last month, forty-six members of the Torrey Botanical Club met in the Members' Room of the Garden Mar. 18 to hear Dr. Barbara McClintock of the Carnegie Institution of Cold Spring Harbor speak on "The Contribution of the Nucleolus to Genetic Investigations." Tea was served after the lecture. On March 3 Dr. R. R. Stewart addressed the club in the evening at the American Museum of Natural History on "The Plants of Kashmir."

Conferences. Dr. E. J. Schreiner, a former student at the New York Botanical Garden, addressed the monthly conference of the staff and registered students of the Garden Feb. 11 on "Progress in Forest Genetics Research at the Northeast Forest Experiment Station," where he is now located. Dr. Clyde Chandler spoke on "Researches on Sterilities in Petunia" and Dr. A. B. Stout spoke on "Flowering Behavior and its Heredity in Hemerocallis" at the conference March 11.

Cycad. For the second time, on March 31 the Botanical Garden's specimen of *Stangeria eriopus* (*S. paradoxa*) was artificially pollinated. This time pollen from *Zamia portoricensis* was used. More than a year ago artificial cross pollination was attempted, *Zamia monticola*, a Florida species which was under cultivation at the University of Chicago, being used. No seeds resulted from the

1941 pollination. Pollen of the Puerto Rican species was also obtained from the University of Chicago.

Groups. Among the college students who have made special trips to New York Botanical Garden in recent weeks are members of the Thallophyte course at Hunter College, who came four times under the direction of Dr. Dorothy Hammond, and a class in horticulture from Columbia University, under Howard R. Sebold. In addition a group from the Hoffman School at Riverdale visited the conservatories Mar. 13 and from the Parsons School of Design Feb. 16.

Boy Scouts of the Bronx Council under the direction of C. H. Sass, Activities Commissioner, came to the Garden the last three Saturdays in March to study problems of the soil and fundamentals of gardening practice.

Students. Miss Esther Zimmer, senior at Hunter College and recipient of a one month's scholarship at the Botanical Garden, is working with Dr. B. O. Dodge on genetics of *Neurospora.* Miss Fairchild Bowler, a Columbia student of botany, is also working with Dr. Dodge on a cytological problem in ascus abortion in *Neurospora.*

Appointment. The executive committee of the Garden's Board of Managers appointed Mrs. Harold I. Pratt Vice-chairman of the City Relations Committee at its meeting Feb. 16.

Conservatory Tours. Howard Swift returned from his new position in Philadelphia on each of the four Sundays scheduled to conduct the series of conservatory tours on the plants of Latin America, announced in the Educational Program. The course was concluded Feb. 15.

Exhibition. At the 65th annual exhibition of the New York Microscopical Society Feb. 7, Joseph F. Burke showed Santa Monica floating fossil diatoms, some specimens of which were presented last year to the New York Botanical Garden.

Spring Lectures at the Garden

Mar. 21 ***A Visit to My Chinese Garden***
With comments on Chinese flowers
George Kin Leung

Mar. 28 ***Winter in Oaxaca***
W. H. Camp, New York Botanical Garden

Apr. 4 ***A Social Approach to Horticulture***
F. Ellwood Allen, National Recreation Association

Apr. 11 ***Gardens of Ancient Egypt***
H. W. Rickett, New York Botanical Garden

Apr. 18 ***Local Ferns and Their Haunts***
Farida Wiley, American Museum of Natural History

Apr. 25 ***America's Own Forests***
With motion pictures from the U. S. Forest Service
J. H. Pierce, New York Botanical Garden

May 2 ***Cacti and Other Desert Plants***
E. J. Alexander, New York Botanical Garden

May 9 ***Flowering Shrubs at the New York Botanical Garden***
Howard R. Sebold, Columbia University

May 16 ***Plants for New York City Roofs***
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Pkwy., or, coming from Westchester, turn we

MEMBERSHIP IN THE GARDEN

Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests. Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public.

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia once a year, each number illustrated with eight colored plates of unusual plants, accompanied by descriptions.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

(4) Announcements of special floral displays, programs, lectures, and other events at the Garden.

(5) Credit to the amount of the membership fee paid, toward courses of study offered by the Garden.

(6) The privilege of borrowing lantern slides from the Garden's collection.

(7) Use of the Members' Room in the Museum Building.

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CAROL H. WOODWARD, Editor

A WARTIME NECESSITY

IN the days when automobiles could be freely used to carry people to distant places of outdoor beauty, there would often be thousands of persons enjoying the New York Botanical Garden on a single Sunday in spring, the majority of them having arrived on foot or by means of a five-cent fare. With New Yorkers now restricted in their travel, the Garden can expect larger crowds than ever before For there is a human need for plants which, though seldom concretely expressed or even realized, goes beyond their use in supplying oxygen to the air and providing all forms of animal life with food Trees, flowers, gardens, shrubs, broad expanses of lawn, are essential to the spirit of man—to his balance, or morale, or whatever one chooses to call a mental state of calmness and sanity. A mind that is troubled can free itself of much of its burden by going into a well kept garden or strolling through the woods Without conscious effort, a man breathes more deeply, more healthily, in the presence of living plants, and gradually a fresh new spirit seems to replace the worn and weary one that had been possessing the senses.

Today there are many troubled minds and hearts. Tomorrow, though we wish it were not so, there will be more. In their need for hope and encouragement and strength, the people naturally turn to a place where the trees stand magnificent against green grass and open sky, where gardens are seen at their best, and where the natural woodlands (which here are still well within the city limits) can carry them in thought and feeling far into the country.

A Botanical Garden which fulfills such a great spiritual need for so large a portion of the population can not be classed as a luxury. More in wartime than in peace, it is a necessity for the upkeep of the people's morale.

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Tea Substitutes In The United States

By Ralph H. Cheney
*Long Island University**

NEWSPAPER headlines in March 1942, to the effect that the "War Production Board (WPB) Orders Tea Sales Halved Immediately" emphasizes the impending shortage of tea. Although the tea stocks in this country had reached an all-time high record on January 1, 1942, with 48,000,000 pounds, this amount represents only approximately six months' supply.

The annual world production of nearly two billion pounds grows primarily in China, India, Ceylon, and Java-Sumatra. In terms of tea chests, according to W. H. Ukers in his book, "All About Tea" (Vol. II, p. 336), this volume would make a tower 2½ times the bulk of the Empire State Building in New York City. That sounds like a lot of tea, but half of it is consumed in the producing countries. China produces the most but India leads in exports. India, Ceylon and Java-Sumatra export 85% of the world's tea and most of the rest comes from Japan and its possessions. The United States has usually bought between 81,000,000 and 96,000,000 pounds annually, for which it pays 15 to 18 million dollars. However, in 1940, the United States imported 100,000,000 pounds and in 1941 it reached a record of 107,000,000 pounds. Nine-tenths of it is "black" tea (slightly fermented) and one-tenth is "green" tea (unfermented) and chiefly from Japan.

Only Great Britain exceeds our gross tea consumption and only the Tibetans exceed Great Britain in per capita use. The three most important non-alcoholic beverages of the world are tea, coffee and cocoa, and tea leads in the total amount consumed. Tea has an indisputably important place in our diet. While in the United States 94.6% of our homes serve hot coffee, 87.5% also serve hot tea.

* Dr. Cheney is also Resident Investigator of Economic Plants at the Brooklyn Botanic Garden.

China tea can be grown successfully in the United States but only at a high cost. In the 1880's, a 100-acre tea farm was established in South Carolina which reached a maximum production of 4,500 pounds of tea in one year. Another experimental tea farm was located in Texas but both projects were abandoned because production costs prevented competition with imported tea. Today, tea is grown commercially in North America only in Guatemala where the tea plantations are small. Now that production and shipping conditions have been interfered with in the Orient, the population of the United States must turn, in part at least, to substitute teas as people have done in other places where the war has already imposed this situation. The published diet of the German army camps includes a tea substitute, but which one is not stated.

Dangers in Tea Substitutes

There are a great number of plants in every country which have been used locally as teas. However, the majority of them do not appeal to the average taste. Most of them are too "herby" in flavor and the majority of them have been recommended to us from previous generations for use primarily as medicinal rather than beverage teas. In fact, I would question seriously whether it would be safe to attempt to consume many of these native teas regularly and in great quantities. For example, black raspberry leaves (*Rubus occidentalis*) have often been recommended to us as a tea source from Revolutionary days to the present. The drink tastes and smells much like black tea. However, in England recently, pharmacologists have shown that the ingredients of this beverage have a very definitely relaxing effect upon uterine spasms accompanying childbirth. They substantiate the recommendation of raspberry tea for pregnant women in the Culpepper list of tisanes. Such an effect may be beneficial in reducing the pain of birth but certainly it is not an infusion to be recommended for daily consumption even if palatable. Similarly, the leaves and rootbark of sassafras (*Sassafras variifolium*) have been used as a substitute for tea. In the early days of this country boatloads of sassafras leaves and rootbarks were shipped to England. However, an overdose of the oil of sassafras is a narcotic poison. Many of our available tea sources might serve harmlessly if utilized occasionally and enjoyed for their distinctive flavors; but to substitute them completely, regularly, and in appreciable volume for our accustomed China tea is quite another matter.

Harmless Native and Home-grown Plants

We do have several substitute tea sources in the United States. One in particular is excellent when properly prepared and it might very well become a nationally consumed native tea in times of peace as well as war. Before I discuss this one may I mention several minor sources of

tea which might receive favor from individuals who are interested in home-growing or in preparing beverages of distinctive and pleasing flavors derived from collected and dried plants. Before any leaf source is used as a tea it should be remembered that if China tea leaves have to be prepared carefully and brewed with precision, it is not only reasonable but mandatory that any substitute teas would require similarly exacting procedures to produce a palatable beverage. Each kind of tea substitute must be given variations in the preparation which have been found by experience to be advantageous, but a few general rules may be suggested.

Preparation

The *young* leaves possess generally a maximum of desirable flavoring principles and a minimum of the tannin and other constituents which contribute unpalatable bitterness, astringency, and too "herby" characteristics to the beverage. Moreover, unless one wishes deliberately to change the flavor, the leaves should not be allowed to ferment and the action of molds and wild yeasts should be avoided. The stems should be cut with their leaves just before the plant blossoms. It is preferable to do this harvesting between 10 A. M. and 3 P. M. on a sunny day so that the dew is thoroughly dried. The stalks should be gathered into loose bunches and hung in the sun to dry for 30 to 60 minutes (not longer because of excessive chemical changes under extreme light exposure). Then they should be removed to an airy, dark (at least, not well lighted) place and kept there until thoroughly dry and crisp. It is not necessary to carry them out and indoors daily on trays. When thoroughly dried, the leaves should be stripped *roughly* from the stems to crumple them, then stored in the dark in tight glass jars.

Brewing

In the preparation of the beverage prior to serving, the method used will either rob the tea of its tasty potentialities or will preserve its appealing flavor. As in the preparation of an individual kind of leaf, variations in brewing are advantageous in accordance with the tea substitute used. General rules can be suggested as guides. Very flavory varieties make a better brew if hard water is employed. If the water supply in your home is soft, the less flavory species make a more palatable beverage for the average taste.

In most instances it is deleterious to boil the leaves. The best rule demands one heaping teaspoonful to a cup (or more according to taste) and one for the pot if more than four cups are brewed at a time. Percolation may be practised for a few minutes. The time can be judged according to the strength desired, or an infusion may be prepared by pouring freshly drawn *boiling* water over the leaves and allowing it to stand 3 to 5 minutes. Less time extracts little but color, while a longer period makes

the brew bitter. A little sugar may be added if desired, with either lemon or milk. In using cassina tea, to be described below, some prefer to boil the leaves 3 to 5 minutes and allow them to stand for 5 additional minutes, then to dilute the resulting decoction with hot water to the desired strength. Others prefer to percolate cassina tea for 10 minutes.

Plants Available

With the foregoing rules and comments in mind, may I suggest a few of the commonly available plants which may be used to prepare acceptable substitute beverages for the popular China tea. Many herbs supply leaves which can be highly recommended as *additions* to both hot and cold China tea, lemonades, fruit juice cocktails and even to certain alcoholic beverages. Relatively few plants, however, supply leaves which can be substituted completely for China tea. Among these substitute teas which are worthy of serious trial are wild strawberry leaves, true chamomile, Oswego tea, spicebush, teaberry, Californian yerba buena, lemon thyme, lemon verbena, and cassina.

The dried leaves of the wild strawberry (*Fragaria virginiana* and *F vesca*) make an excellent beverage. Boiling water poured over the leaves in a tea-pot and allowed to steep until the desired strength is obtained gives a beverage which resembles the color of China tea and has a "warm" taste which, with a slight stretch of the imagination, is suggestive of the cooked strawberry flavor rather than of the fresh berries. Otherwise it is definitely similar to China tea. One becomes quickly accustomed to it and accepts it gladly. It is certainly the native tea to which one can transfer most readily in place of China tea in the daily diet. Remember the simple rule of one heaping teaspoon of dried leaves to a cup and one for the pot. A 3 to 6-minute infusion (steeping in a pot) results in a beverage which is very acceptable to most tastes. Strawberry tea takes either lemon or milk satisfactorily.

True garden or German chamomile (*Anthemis nobilis*), *not* mayweed (*A. Cotula*, which makes a terrible tea), possesses finely cut decorative leaves, but it is the dried flowers which can be the source of a palatable aromatic tea. It is served to patrons in a number of exclusive beauty shops. Since the flowers instead of the leaves are used, the preparation and serving of the beverage are somewhat different. A pint of boiling water is poured over a half ounce of the dried flowers and allowed to steep for 10 minutes. The infusion is strained, honey or sugar is added, and the drink is served with cream. The beverage has a pleasant flavor for those who are accustomed to drinking their tea with milk or cream. The only factor to which one must make an adjustment is the aroma, which is stronger than in ordinary tea.

Bee-balm or Oswego tea (*Monarda didyma*) was used by the Indians and an infusion of the leaves (made by pouring boiling water on them,

but not by boiling them in water) is made still by some country folks in northern New England. It is acceptable, but not the best substitute for real tea.

Peppermint tea (*Mentha piperita*), made by an infusion of the dried leaves of either the black or white variety, is a palatable tea and undoubtedly is an aid to digestion. However, from childhood I have always associated it with a stomach-ache so I have personally never learned to enjoy it. This tea is obtainable on the market under the name of mint tea. The white variety is preferable. Sometimes it is mixed with orange pekoe and in this way (a mixture of China tea and mint) it is very acceptable to most tastes. The Arabs have practised adding mint to "green" tea for many years.

Teaberry (*Gaultheria procumbens*), also known as checkerberry, boxberry, creeping wintergreen, mountain tea, and Canadian tea, has enticing possibilities if one has the patience to collect *young* leaves individually. If prepared carefully, the labor and time involved will be well rewarded for personal use. I doubt whether it could ever be put on a commercial basis as it would be difficult to gather a sufficient volume of the small young leaves, even though the plant is very common in many localities. It was used in Colonial days and its revival might well be undertaken. Its warm birchy flavor is highly pleasing to many people. The addition of a few drops of lemon is effective in teaberry tea. It is the oil of wintergreen (methyl salicylate) that was distilled originally from this plant which flavors teaberry gum. The leaves are collected annually to some extent and the oil is obtained by crude stills in one rural section of Pennsylvania.

Spicebush tea (*Benzoin aestivale* or *Lindera Benzoin*), or the southern species (*B. melissaefolium*) was described as palatable as early as 1796 by the French botanist, André Michaux. This tea is prepared by making a decoction, that is, actually boiling the young twig tips for ten minutes. A fragrant, spicy, pleasantly-flavored tea results.

Californian yerba buena (*Micromeria Douglasii*) is a source of tea leaves occurring along the coastal ranges from California to British Columbia and long known to the Indians and early Spaniards of California as a refreshing beverage. During the summer of 1941, I had an opportunity to drink an infusion of the dried leaves prepared by steeping for 10 minutes in very hot water. The beverage is slightly aromatic and acceptable. The plant is a vine-like member of the Mint family.

Tea-thyme tea should be brewed *only* from the *lemon flavored variety* of the creeping thyme (*Thymus Serpyllum*) known as lemon thyme. There are more than twenty varieties of *Thymus Serpyllum* and only this one is really desirable for beverage purposes. The living plants can be purchased from nurseries. The addition of a half dozen fresh leaves to real tea imparts a delicious lemon tang. An infusion of the fresh or dried

leaves possesses a lemony and spicy taste which is palatable and refreshing. Some people approve especially of the addition of a slice of lemon to be served with this tea.

Similarly the dried leaves of lemon-verbena (*Lippia citriodora*) make a delicious hot tea. It has an excellent fragrance, is greenish in color, and possesses a lemon-lime flavor which is so surprising in a tea that it takes a few cups to become accustomed to it. Many people, however, learn to enjoy it very quickly. It is used quite commonly in Chile. It can be purchased in herb tea shops in bags or the living plants can be procured from nurseries.

Many other tea sources have been highly recommended in the literature of the past but they have never appealed to my taste. Until I can find tea-tasters who vouch for them I can not include them here merely upon historical statements. Among these plants are the New Jersey tea (*Ceanothus americanus*), known from Revolutionary days. Upon trying the young leaves of this, I feel that our Colonial population must have been in drastic need of a tea substitute beverage. However, the older literature reports it as excellent.

The dittany, candleplant or gas-plant (*Dictamnus albus*) with its lemon-scented leaves has been recommended as the source of a delicious tea. My personal experience in testing an infusion of the dried leaves would be expressed as horribly herby and unpleasant.

Mountain tea from the dried leaves of the sweet or fragrant goldenrod (*Solidago odora*) has been peddled in winter in rural areas as a source of income. Its beverage is not palatable to most tastes.

Cassina, A North American Tea Source

The true cassina, yaupon, or North American tea-plant, known also as "black drink," is derived from the leaves of *Ilex vomitoria*, which is related to the South American *Ilex paraguayensis*, the true source of Paraguay tea or maté. The caffeine content of the leaves of maté averages 1.25%. In the United States there are nine species of *Ilex*, the leaves of which contain from none to slightly over 1% of caffeine. Among these species are the dahoon holly (*Ilex Cassine*) which is used sometimes instead of the true cassina, though its leaves contain less caffeine, and the inkberry (*Ilex glabra*), which is also employed occasionally as a substitute. Neither the American holly (*Ilex opaca*) nor the winterberry (*Ilex verticillata*) can be used as a beverage. The only two North American species of holly that have any appreciable amount of caffeine are *Ilex Cassine* and *Ilex vomitoria*, the dried leaves of the latter having a caffeine content varying from 0.25% to 1.0%. These two species have a similar range, covering 40,000 square miles extending inland for a distance of only 20 to 30 miles from the James River, Virginia, southward through Florida and westward through the Gulf States to the Rio Grande

River. Both are abundant in North and South Carolina and they form dense thickets on the Sea Islands off the coast of South Carolina. However, it is *Ilex vomitoria,* the true cassina, from which the leaves should be gathered for tea. In spite of the unpleasant intimation of the name, this species produces the superior leaves for beverage purposes.

Known since 1650, the possibilities of the shrub have been investigated numerous times and the leaves have been used for a beverage down to the present time in rural areas. This plant undoubtedly offers the best possibility of a commercially practical, native source of tea. The non-development of cassina as a national beverage seems to be based primarily on the fact that the American public was accustomed to China tea, so under normal conditions there has been no good reason for making a complete change. However, with the blockade during the Civil War, the South used cassina to a considerable extent.

The best testimony in favor of the palatability of cassina is found perhaps in the results of an investigation conducted by Mr. George F. Mitchell under a Congressional appropriation in 1922. Black cassina (fermented), green cassina (called cassina maté), and a mixed blend were prepared.* Black cassina and the mixed blend should be percolated for ten minutes. The green cassina can be brewed like ordinary tea by pouring boiling water over it and allowing it to steep for three minutes. North Americans who have lived in Argentina where they were accustomed to the South American maté agree that the mixed blend is fully as pleasing a beverage as maté. In 1922, 30 gallons of hot cassina tea were served each day at the County Fair in Charleston, South Carolina. Also 1,500 bottles of the carbonated cassina "pop" found popular favor. In 1923, cassina ice-cream (with a somewhat vanilla-like flavor) was served to 60,000 U.S.D.A. employees and was received favorably. Three cassina products—tea leaves, an alcoholic extract for ice-cream flavoring purposes, and a syrup for carbonated beverages—all possess very definite potentialities for use in the development of this native plant on a commercial basis. If adopted in a time of China tea shortage and the current national emergency, the use might very well be continued in times of peace.

From a practical viewpoint, the use of the various tea substitutes discussed here, with the exception of cassina, could only be grown or collected for individual family use. As a commercial substitute, if China tea becomes impossible to obtain, the tea-like beverage to which the public palate of the United States would probably become accustomed most readily would be the South American maté. Like China tea, the leaves contain the stimulating caffeine, so its effect is similar to that of ordinary tea. Moreover, it is already being sold by some of the larger grocery stores in both the "regular" and so-called "toasted" form. The "regular"

*For details, see Chapter X, "Caffeine-yielding Plants of the World" in a book by the author entitled "Coffee" published by the New York University Press in 1925.

makes a beverage which is lighter in color and slightly greenish in comparison with China tea; whereas, the "toasted" is similar in color to ordinary tea. This color correction overcomes the objection which some people have to a tea which does not possess the color they expect to see. When served either hot or cold and with sugar and lemon or milk, the beverage is very palatable. With a week's trial, the average person becomes readily fond of the new tea. Both the "regular" and "toasted" maté is brewed by percolation for a few minutes or by steeping for 3 to 5 minutes. The price (May 1942) of each is 34 cents per half pound. If shipping conditions or its large home consumption in the Paraguay and Uraguay producing areas should cause a serious reduction in the amount available to the United States, our native cassina tea would be our most practical species to develop for commercial production.

Succulent Plants Of The Old World

By E. J. Alexander

THIS article, which is continued from the April Journal, is the concluding number in the series prepared by Mr. Alexander, largely from material in the Garden's collection of succulent plants in Houses 6, 7, and 8 in the Main Conservatories. Preceding instalments in the series have appeared in the Journals for February 1941 (Desert Cacti of the Americas), July 1941 (Succulent Plants of the American Deserts), November 1941 (Stone-Mimicry and Windowed Plants), and April 1942 (the first instalment of Succulent Plants of the Old World).*

The Euphorbias

WHAT the cacti are to the New World, the succulent euphorbias are to the Old. Many of them exhibit the same diversity of form, from ball and melon shapes to barrel-like and columnar, while some are candelabriform trees which are dominant features of the landscapes where they grow. One group of species has a mass of snake-like branches spreading from a basal globe like a gorgon's head.

Besides these cactoid forms, in some species the branches are pencil-like; in a few they are woody with thorn-tipped twigs; and in one they are thinly flattened. In others there are large tuberous stem-bases with either succulent or spindly growths arising from the center.

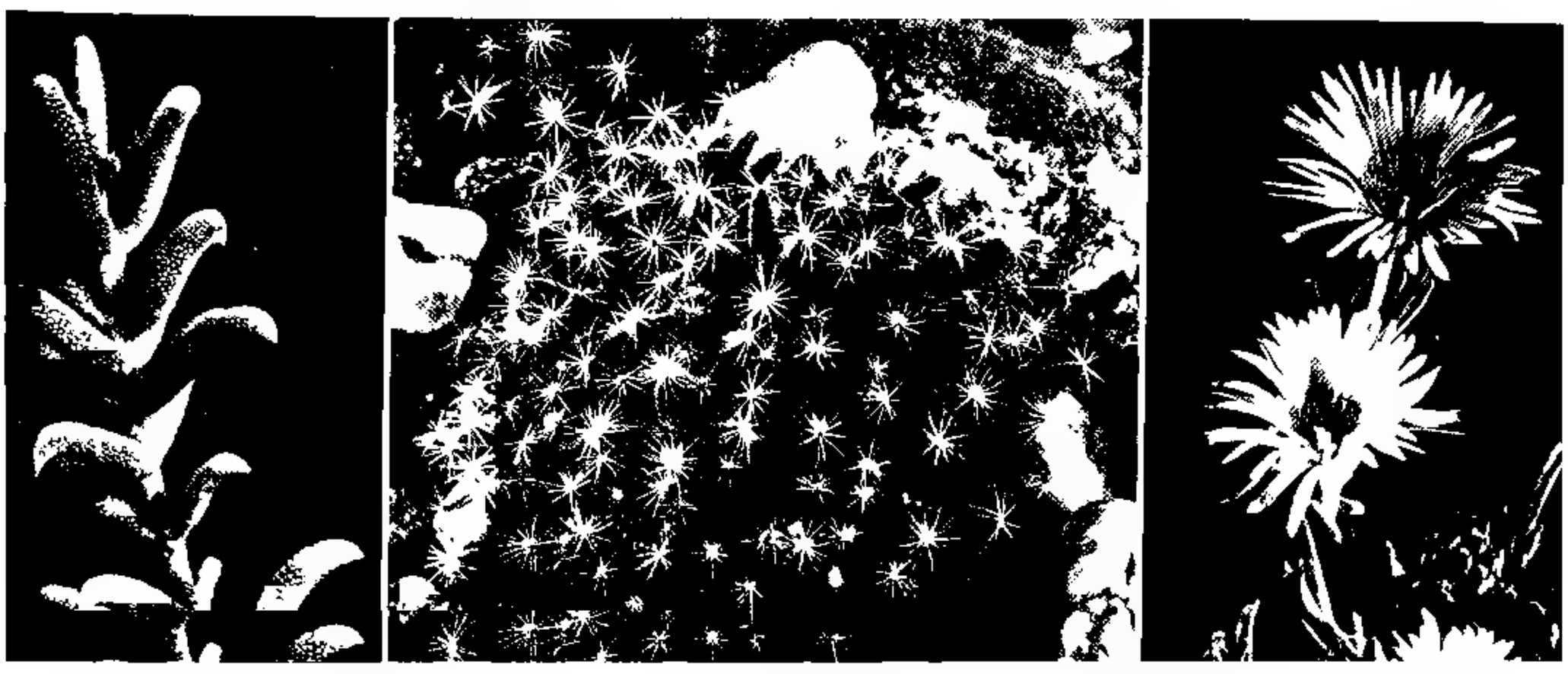
* Because of the large amount of material which is not yet known in cultivation, but which has been mentioned in this concluding article, the library of the New York Botanical Garden has been extensively drawn upon for descriptions of some species.

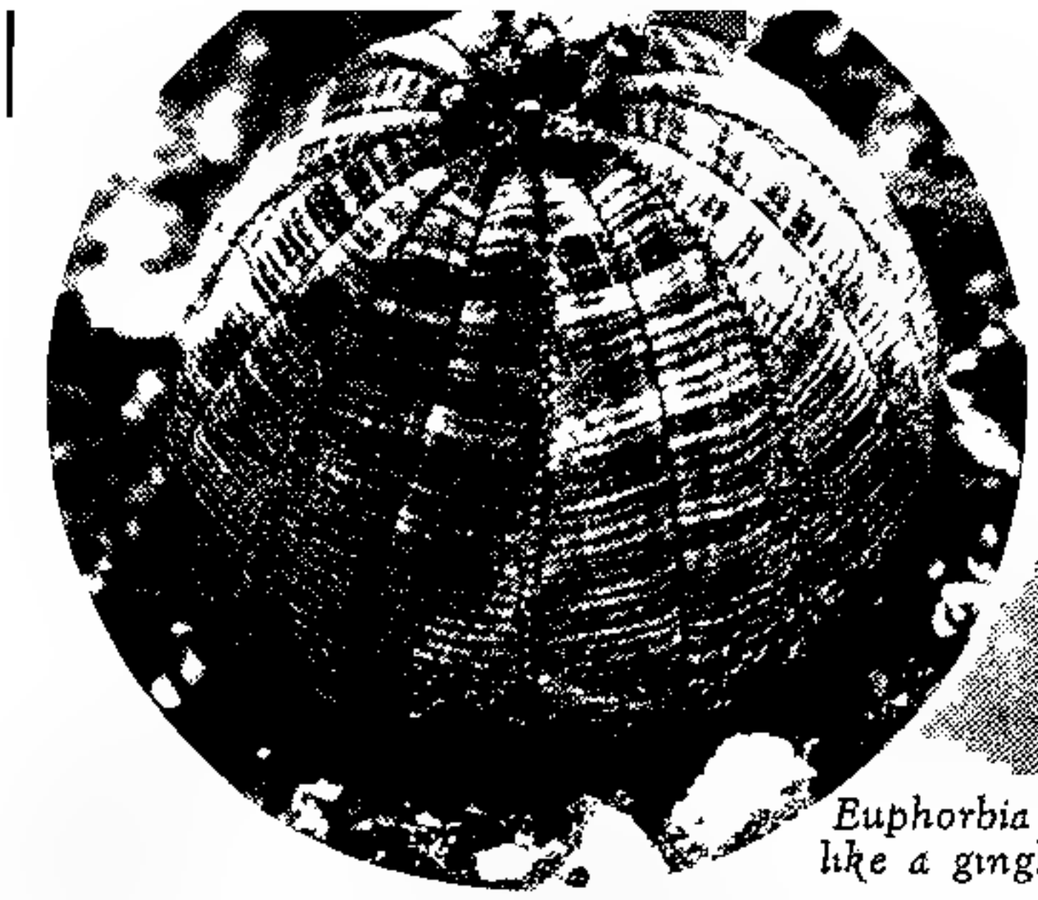
PARADOXES AMONG THE SUCCULENTS

Pelargonium paradoxum is the name of the first, shown in the upper left-hand corner. One of many succulent plants in the Geranium family, this species is one of the most obese of all. At the right is one of only two or three specimens of this plant known in cultivation anywhere in the world. It is Pachypodium namaquanum, known as "half-mense" or "half-man" in the rocky desert regions where it grows in the dryest and hottest part of Southwest Africa. Below are three types of Mesembryanthema, a species of Trichodiadema with frost-like beads on leaves and stem at the left; typical flowers of the entire group at the right; and in the center a cactus-like specimen appropriately known as Trichodiadema stellatum.

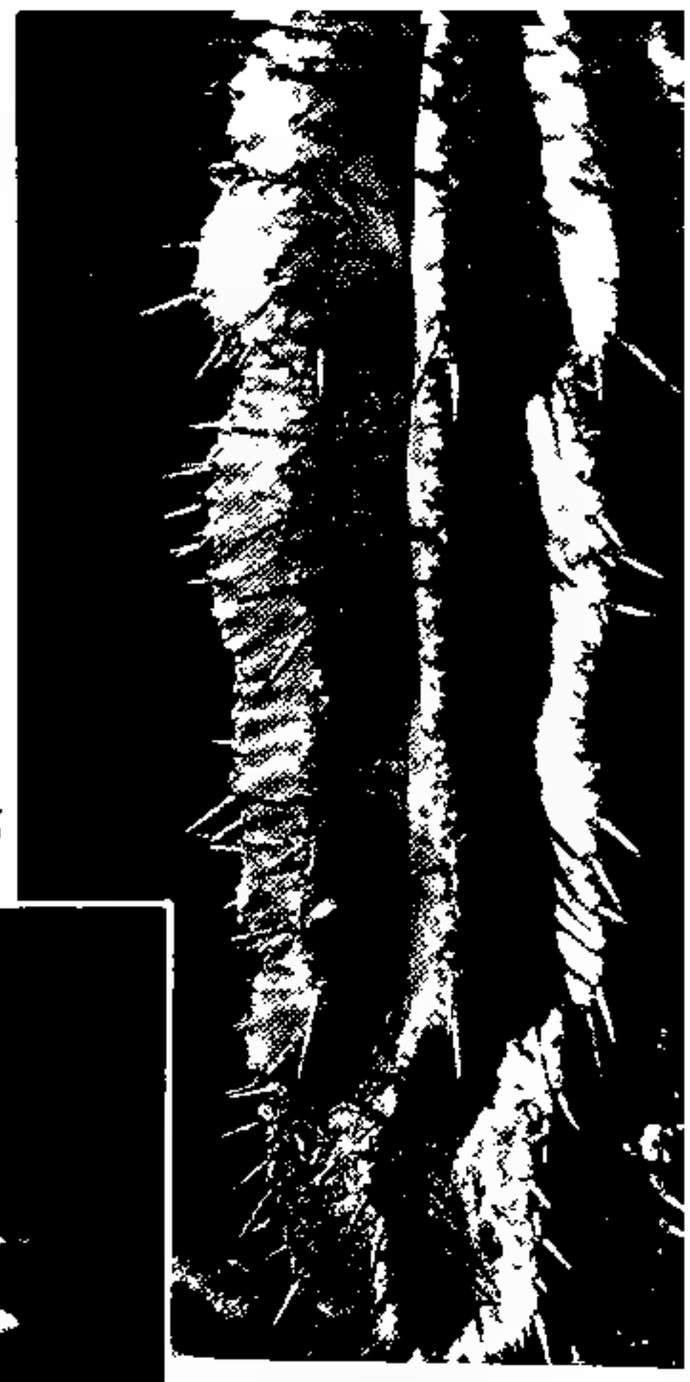
A limited number of the columnar euphorbias have large leaves on the new growth, while the gorgon's-head sorts have small leaves, and some of the pencil-shaped and the tuberous-stemmed species have leaves that are long and narrow. In the majority, however, the leaves are rudimentary ones or are completely absent.

The spines of the euphorbias are of several types. Some, occurring in pairs or solitary, appear to be modified leaf-stipules; some are sterile





Euphorbia obesa looking like a gingham baseball.

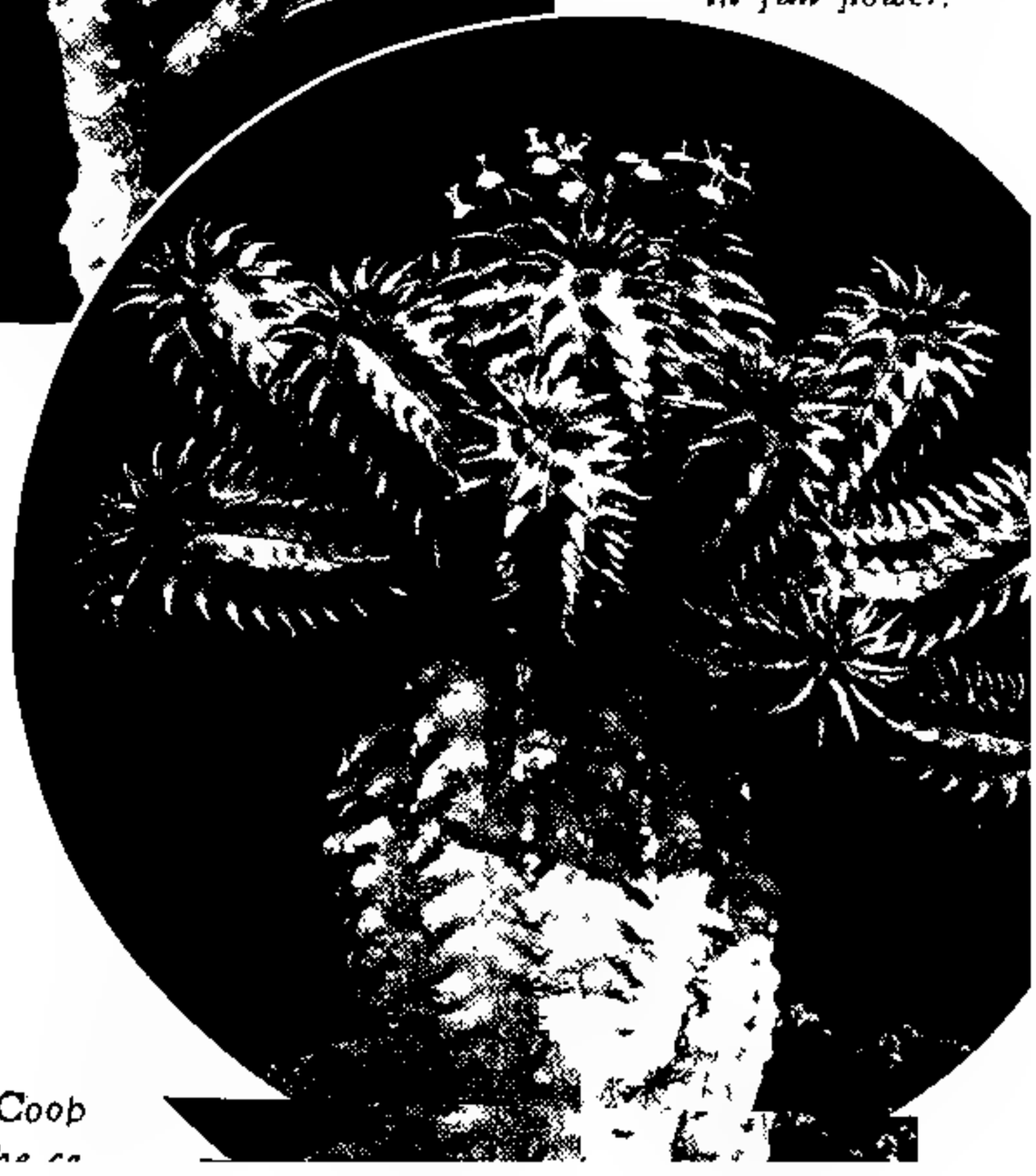


EUPHORBIAS FROM DESERT REGIONS

Euphorbia polygona, spines are aborted ft branches.

Euphorbia neriifolia, of the leafy form

Euphorbia Suzannae, in full flower.



Euphorbia Coop

inflorescence-branches, some inflorescence-branches hardened after the flowers have fallen, and some are hardened stem-tips. None, however, arise from a cushion-like growth center (areole) as do those of cacti.

All euphorbias have the flower structure called a CYATHIUM, which is typical of their tribe. While flower-like in appearance, the cyathium is structurally an inflorescence, or cluster of flowers. What appears to be the calyx is an involucre formed by the partial fusion of five bracts. Sometimes these bracts have fringed margins, but more often they bear large yellow glands which frequently have yellow, white, green, or yellowish petaloid appendages. (Occasionally, though rarely, these appendages are purplish or brownish tinged.) Often, when there are no appendages, the glands are crescent-shaped or with long forked tips, or they may be elliptical and blunt. In two species (*E. splendens* and *E. Bojeri*) the cyathium is subtended by two petaloid red bracts. Within the cyathium, ordinarily, are several stamens and a single pistil. Each of these is on a jointed stalk, showing that each stamen is a single, much reduced, male flower and the pistil a reduced female flower. Sometimes the plants are dioecious, the cyathium containing only a cluster of male flowers or one female flower. The fruit is a three-lobed capsule, each lobe with a single seed, although in a few cases only one lobe develops. In one species (*Elaeophorbia drupifera*) the fruit is a fleshy drupe. All euphorbias have a milky sap which is sometimes dangerously poisonous, causing sores or burns on the skin and serious irritations if it gets into a wound or into the eyes, though a few species are said to be used as cattle-food in South Africa.

The genus *Monadenium* differs from *Euphorbia* in having the cyathium deeply cleft on one side with a fringed lobe at either side of the cleft. There are only five or six truly succulent species of this genus. They are similar to the deciduous-leaved *Euphorbia neriifolia*. It appears that only two of them have been grown in the United States –*M. Lugardae* with almost flat tubercles on the stem and *M. Schubei* with prominent tubercles. The leaves are similar, those of the latter more strongly veined and crisped on the margin.

The species of *Synadenium* are all much alike. They are succulent-stemmed, leafy shrubs differing from *Euphorbia* in habit of growth and in technical inflorescence-structure.

Elaeophorbia is one of the most poisonous of all the succulent Euphorbiae. It is a large upright-branched plant with very thick stout stems. Only *E. drupifera* is in cultivation. It is similar in appearance to *Euphorbia neriifolia*, but the leaves are more fleshy and the fruit more succulent.

In Madagascar, land of so many strange plant-forms, is an isolated group of three or four species of the genus *Didierea*. These plants are very similar in appearance to the branched cactoid euphorbias of Africa and to the cerei of America. Their flower and fruit structure is so

different from either, however, that botanists have placed them in a distinct family, the Didiereaceae, most nearly related to the cashew-nuts and the soap-berries.

Succulents in the Grape Family

One would not ordinarily expect succulent species in the Vitaceae, the family of vines and grapes, yet there are five species in the genus *Cissus*, which belong in this category. Two of them, *C. quadrangularis* and *C. cactiformis,* have 4-angled jointed stems, and are of clambering growth. They must be grown, however, under conditions suitable for begonias and epiphyllums. The other three are true desert succulents from Southwest Africa, one of the regions of strange growth-forms. Two of them are tapering-barrel-shaped, 2 to 6 feet tall, nearly a foot in diameter at the base and more or less branched above, all covered with a yellowish green, papery skin which peels off with age; the leaves are shiny green. The third one reaches 13 feet in height and 18 inches in diameter at the base; it is much branched, with felt covered leaves and yellow bark which is also papery-peeling.

Some Plant Monstrosities

There are some even more fantastic forms of succulent shrubs and trees in the Apocynaceae, the same family to which the spreading dogbane of our roadsides belongs. Those of which one generally reads belong to the genus *Pachypodium*, in which there are about 20 species, all shrubby or arborescent, some with tuberous-thickened stem bases, and all highly succulent. The stems are either unbranched columns or are like huge inverted carrots with branches above, usually completely covered with spines. The leaves are deciduous and short-lived, the flowers large and showy, white, pink or reddish. Still more bizarre are the species of *Adenium* which are similar in form and flower, but with smooth stems. Of the 15 known species, *A. socotranum* from the island of Socotra is the most unusual, a grotesque monstrosity of the plant world. It is a smooth-trunked tree 15 to 18 feet tall with a trunk girth of 6 to 8 feet and a few ridiculously fat branches which in turn have a few equally fat twigs each tipped by a cluster of leaves or flowers. The other species are smaller in stature and somewhat less grotesque. The only species which has reached this country is *A. coeactaneum*.

Some strange members of the family Icacinaceae grow in the thorn-scrub country of Tanganyika. The best known species is *Pyrenacantha malvifolia*, which has a swollen stem base 3 to 4 feet across, seated on the ground and topped by a few thick branch-bases which are also topped by a bushy crown that is intricately branched.

The Passion-flower family (Passifloraceae) also offers some strange tuberous-based plants. There are numerous species of *Adenia* (to be

distinguished from the genus *Adenium* in the Apocynaceae) with huge swollen stem-bases seated on the ground or half-buried, with upright, sprawling, or even climbing annual stems arising from the crown. These stems, which are usually succulent, are sometimes very thorny, at other times smooth or angled, and they bear yellow or orange funnelform flowers followed by berries of a similar color. Strangest in the family is *Echinothamnus Pechuelii,* which grows on vertical cliff walls in Damaraland, Southwest Africa. The plant is composed of 20 or 30 swollen, fleshy, globular heads, fused at the base into a single body, which is anchored into rock-clefts by a single tap-root. Each head is topped by a tuft of short twiggy branches with tiny narrow leaves and equally tiny flowers in the leaf-axils. The mature plant is said to weigh a half-ton.

Stapelias—Cousins of the Milkweed

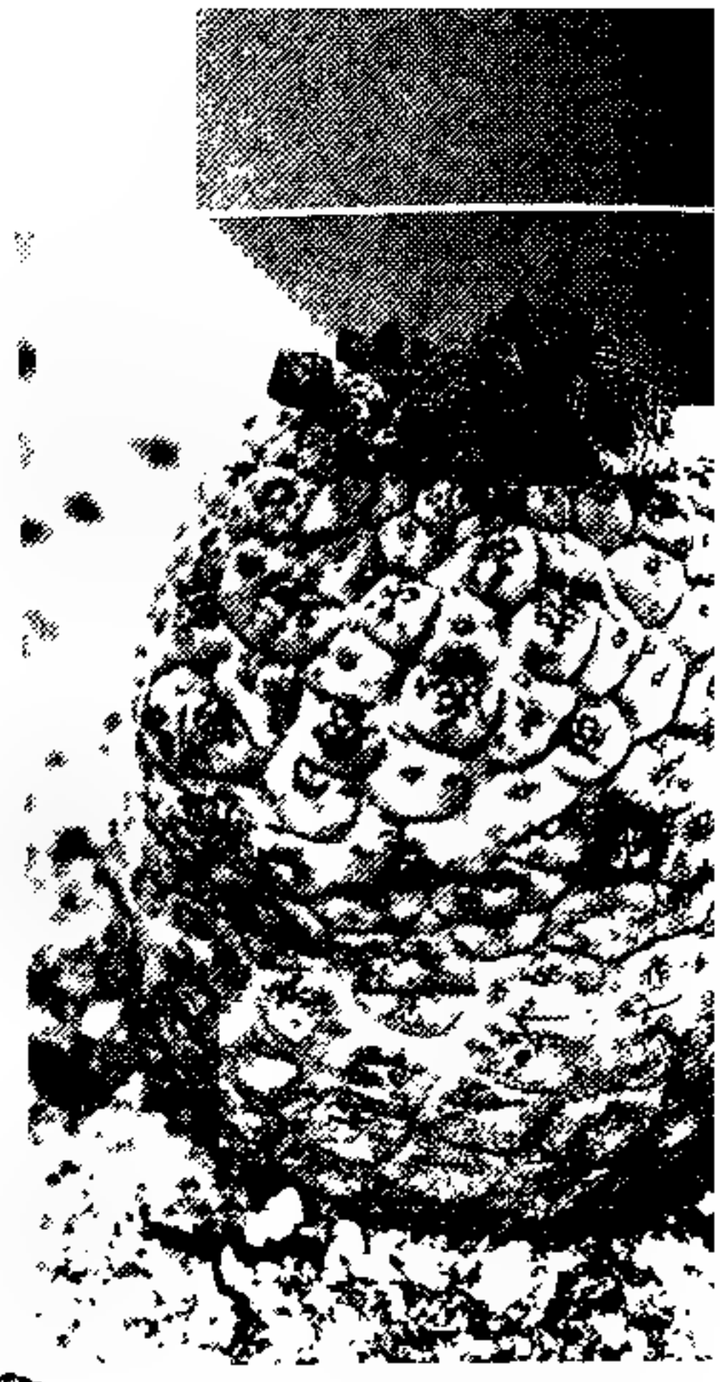
Better known horticulturally are the succulent members of the Milkweed family (Asclepiadaceae). They are mostly in the two tribes Stapeliae and Ceropegiae. In the Stapeliae are 20 genera and nearly 400 species, and in all that agglomeration only one species has leaves: *Frerea indica,* a rare plant not known to be in cultivation in America. It is thought to be a relic of the ancestral types from which the modern species of the tribe were evolved.

Many of the stapelias have star-shaped flowers. *Caralluma, Stapelia, Duvalia,* and the lesser known *Edithcolea, Stultitia,* and *Diplocyatha* have shallowly cupped, short tubes; Huernias are bell-shaped, Tavaresias long-tubular, and Hoodias saucer-shaped, while flowers in the remaining lesser known genera are bell-shaped, sometimes with inward-arching petals that are united at their tips. They vary in color from greenish white to yellow, maroon, brown, and black-purple; sometimes the face of the corolla is smooth, sometimes wrinkled or warty, and frequently it is covered with white, yellow, purplish, or rose-colored hairs. Some of the flowers are mottled with two or more colors. Nearly all are carrion scented, often overpoweringly so. One species of *Stapelia, S. gigantea,* ranks as one of the world's largest flowers, measuring 18 inches across.

The fruits are the typical spindle-shaped milkweed pods, with flat seeds bearing the milkweed's usual tuft of silk.

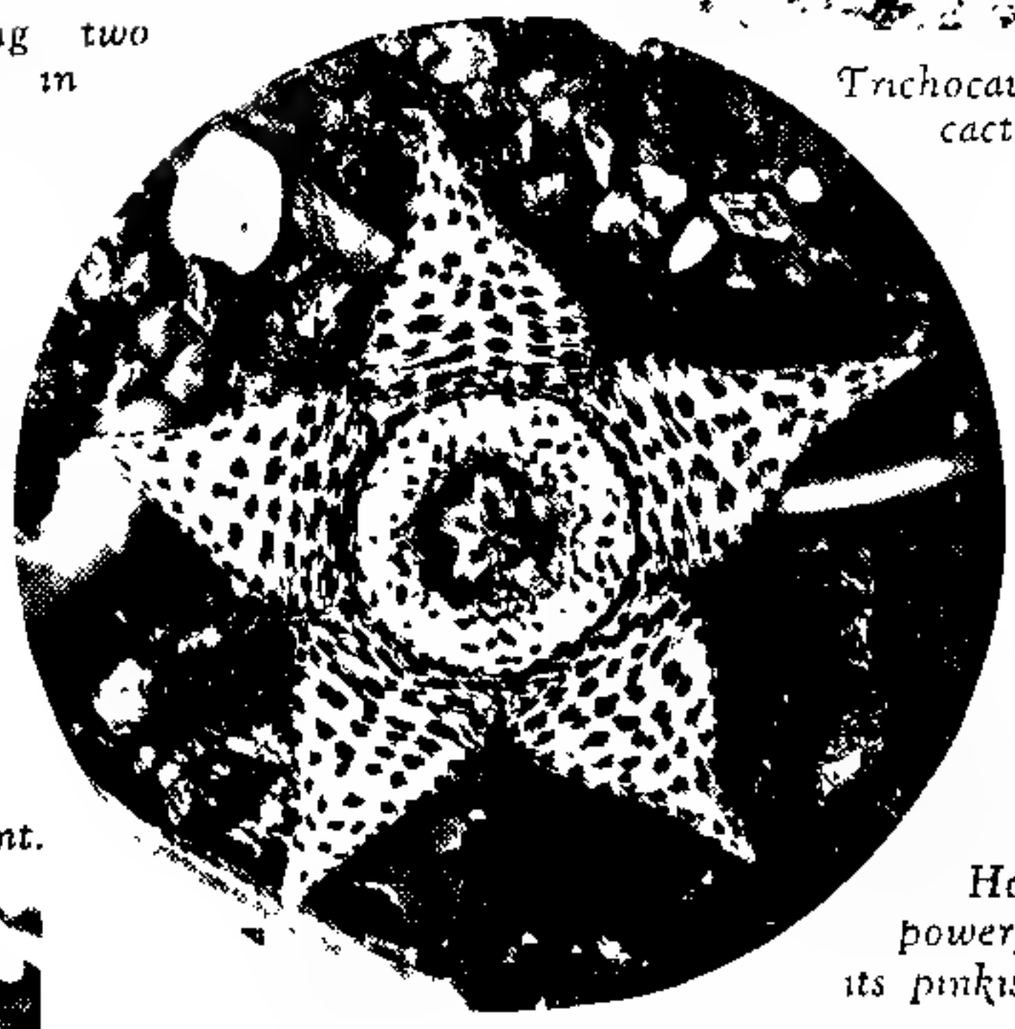
The stems of the stapelias are smooth or velvety, thick and extremely succulent, with watery yet sticky juice. In cross-section they vary from circular to many-angled, the majority having 4 to 6 sides with the angles prominently ridged, the three genera *Hoodia, Tavaresia,* and *Trichocaulon* having many angles. They range in height from prostrate to 6 feet, but those that stand over 1 foot high are rare. All have tubercles of one sort or another on the stems—nearly flat ones in *Echidnopsis,* spiny processes in *Hoodia* and in some species of *Trichocaulon,* triple spines in *Tavaresia,* and soft or hard spine-like teeth in the remaining genera.

Stapelia Leendertziae, showing two open flowers nearly 4 inches in diameter.



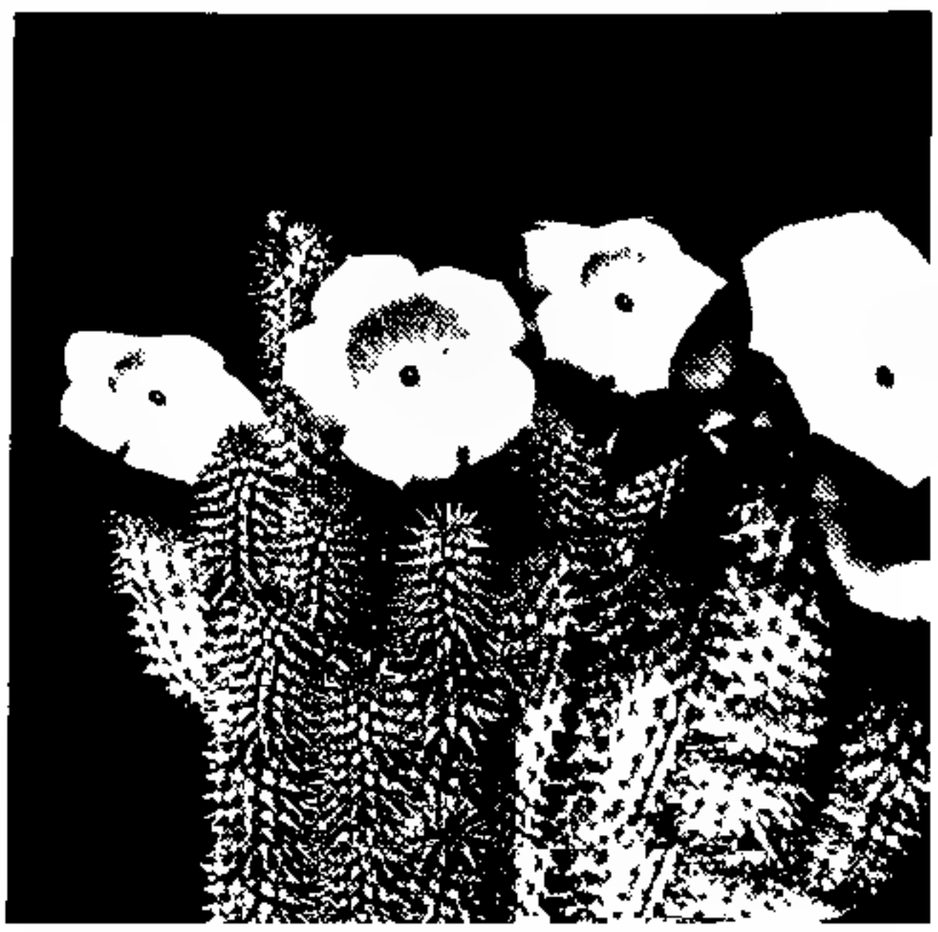
Trichocaulon pictum, a cactoid type of stapeliad, enlarged.

Stapelia variegata, nearly natural size; the first of its genus to be introduced into cultivation from its native home in South Africa.



Ceropegia stapeliaeformis, a twining succulent.

Hoodia Bainii, with a powerful carrion odor its pinkish flowers.



The stems of all species are said to be edible, being so much sought after in their native home by adults, children, animals and birds, especially ostriches, that there is some danger of extermination of at least the rarer kinds.

A few species each of *Caralluma, Stapelia, Huernia,* and *Echidnopsis* are easy horticultural subjects. The remainder are difficult to grow and few if any gardeners have succeeded with any quantity of species. They will probably always be a trial on the patience and ingenuity of those who would make living collections of them, and certain species (*Caralluma retrospiciens* and *Edithcolea grandis*), have defied all attempts at their cultivation.

In the tribe Ceropegiae are a number of interesting genera, few of which have ever been introduced into cultivation, only the species of *Ceropegia* itself having been tried with success. The most succulent one, *Ceropegia stapeliaeformis,* is frequently grown and is a free bloomer. Equally common is *C. dichotoma* with stiff, straight, pencil stems and short-lived narrow leaves. There are many vining or creeping species in the genus, as well as those with tuberous stem-bases and leafy annual flowering stems. There are three types of flower form: with spreading petals as in *C. stapeliaeformis;* with petal-tips united above a narrow, bulbous-based tube; and the umbrella form as in *C. Sandersonii.*

In this same tribe are several other genera with tuberous underground stem and annual, leafy and flowering top growth, notably *Brachystelma* and *Raphionacme.* Species of these would be welcome additions to collections of succulent plants—for as such they must be grown. Scattered among several tribes in the family are many species similar in form to the well-known *Sarcostemma viminalis,* mostly of stiff upright growth, but with an occasional species of sprawling habit.

More Fleshy-Stemmed Curiosities

The Pedaliaceae (Sesame family) contains several succulent genera. *Pterodiscus,* with five or six species, has flask-shaped or knobby thick stems and large orange or purple funnelform flowers. *Sesamothamnus* is mostly a thorn-scrub genus, but two species have thick, fleshy, tuberous-based stems sometimes 2 feet in diameter, bearing funnelform flowers that are white or pinkish. The two genera *Rogeria* and *Harpagophytum* have heavy-tuberous, partly buried stems and leafy flowering stems that are either upright or creeping. The flowers are large and showy.

Among the strangest of succulents is the one tree member of the Gourd family (Cucurbitaceae). This genus, *Dendrosicyos,* is restricted to the island of Socotra. It forms an inverted carrot-shaped or flask-like trunk 12 to 16 feet in height with short, thick, fleshy branches at the top. The trunk is so succulent that it may be split through with a pocket-knife.

"Little pickles" is the dealer's name for this fleshy-leaved daisy, Othonna crassifolia, which is sometimes used as a hanging basket plant or, in the West, as a cover for dry banks

Relatives of the Daisies

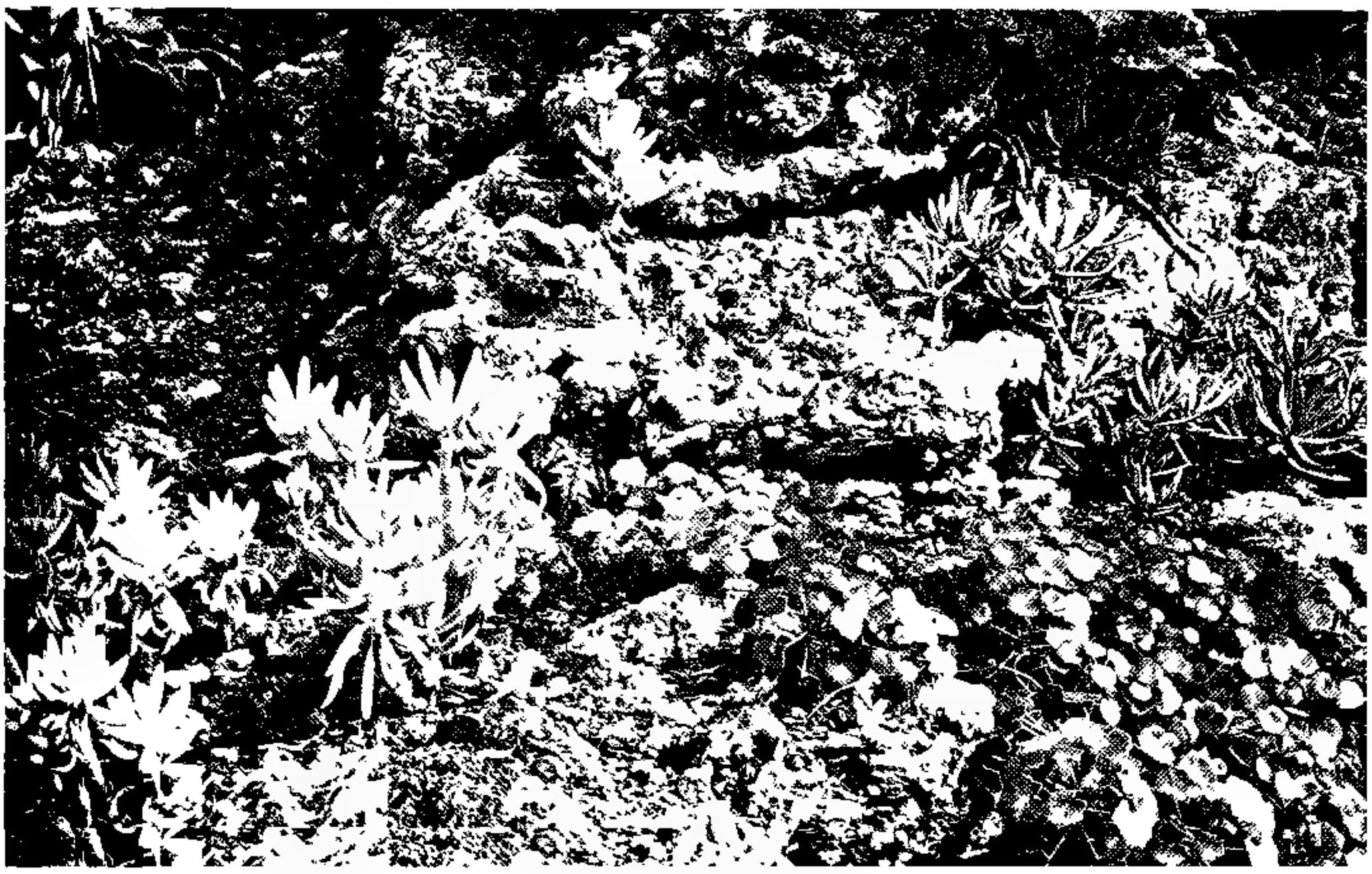
The last group of succulents is in the Composite family, which contains such familiar plants as asters, sunflowers, daisies, thistles, and dandelions. Practically all of the succulent composites are in the four closely related genera—*Senecio, Kleinia, Notonia,* and *Othonna*—in the tribe Senecionidae. *Othonna crassifolia*, sometimes called "little pickles" because of its cylindrical leaves, is the only one of its genus known in American collections, though there are at least ten or twelve other succulent species of *Othonna* which are even more desirable. All have daisy-like yellow flower-heads.

Senecio, Kleinia, and *Notonia* differ so slightly that they are frequently all placed in *Senecio*, but they are here indicated by the initial letters of each distinct genus. In all of them both stems and leaves (when leaves are present) are succulent, and all have small thistle-like flower-heads of white, cream, yellow, red or purple florets in which there are no rays. *S. tropaeolifolius* with nasturtium-like leaves, *S. scaposus* with yellowish-woolly, cylindrical, flat-tipped leaves, and *S. crassissimus* with broad, flat, and thick leaves, are the only succulent true Senecios well known in

America, but there are others in South Africa that we hope will some day reach these shores. Especially is this true for the purple-flowered *S. Klinghardtianus,* the gray-leaved *S. pyramidatus,* the sickle-leaved and stately *S. phonolithicus,* and *S. adenocalyx* with purple-striped stems.

Several species of *Kleinia* are already well known to American succulent fanciers; *K. acaulis, K. aizoides, K. chordifolia, K. ficoides,* and *K. mandraliscae* with cylindrical, bluish leaves, and rather stiff growth-habit; *K. repens* and *K. radicans* with similarly colored leaves but creeping growth; the shrubby, leafless *K. anteuphorbium* and the very tall, thick-stemmed, long-leaved *K. neriifolium* with large clusters of whitish flower-heads; the cut-leaved and popular *K. articulata,* commonly called candle-plant; *K. fulgens* with broad gray leaves and bright red flowers; the beautiful white woolly *K. Haworthii,* often called *K. tomentosus;* and lastly the marbled-stemmed and leafless *K. stapeliaeformis* with two-inch-long flower-heads that look like scarlet paint-brushes. To complete the variety represented in this genus we need only *K. gomphophylla,* a creeper with egg-shaped leaves, but so far this has not arrived in the United States; and *K. cana* with short, fat, white-woolly leaves. There are only three species of *Notonia,* all red-flowered, the best known of which is the leafless *N. pendula,* commonly called inchworm-plant because of its peculiar creeping habit. *K. Grantii* and *K. semperviva* with flat leaves and thick gray stems are but little known.

Three characteristic succulents in the Composite family, growing in the New York Botanical Garden's conservatories. The extremely white felt-like leaves of Kleinia Haworthii contrast strongly with the definitely blue leaves of similar shape in Kleinia Mandraliscae. Between the two are the shield-like leaves of Senecio tropaeolifolius.



Herb Conference Attracts Hundreds For Botanical Garden Program Dealing With Useful Plants

By Carol H. Woodward

THE conference on herbs and drug plants arranged by the New York Botanical Garden for Tuesday and Wednesday, April 7 and 8, attracted nearly 400 persons to the Garden each day.

The ten papers and two motion pictures presented brought out significant facts in the history, culture, uses, and future of the important plants that are used for spices, flavoring, medicines, cosmetics, and perfumery. At the close of the second day, Dr. William J. Bonisteel gave a brief summary of the entire conference, then answered questions from the audience. Only an hour previously, Dr. Bonisteel had concluded an address in which he emphasized the need for increasing the chemical content of the plants that are used in the drug industry, as one means of replenishing the greatly diminished supply of drugs in America.* Pointing to quinine, belladonna, digitalis, stramonium, henbane, and castor beans as essential drugs of which the American supply is already severely limited by the war, Dr. Bonisteel exhibited specimens of digitalis and belladonna which have been improved, the one by selection, the other by chemical treatment of the seeds. He also told of how the yield of quinine in the bark of cinchona trees has been increased by scientific methods from 3% to 12% and in isolated instances even as high as 16%. However, he warned the over-hopeful that to bring a cinchona crop to the point of four times increased yield would require a breeding program lasting about seven years.

To show the human need for these drugs of which our supplies are at stake, Dr. Charles C. Lieb of the Department of Pharmacology of the College of Physicians and Surgeons, Columbia University, vividly described the role of each of them in medicine and their effect on the human system. He mentioned especially aconite, digitalis, belladonna, ergot, castor oil, and quinine.

Except for the summary—and the tea which followed—Dr. Lieb's address closed the conference, which had begun the previous morning with Mrs. Mortimer J. Fox speaking on "The Back-Yard Herb Garden." Mrs. Fox, who is a member of the Advisory Council of the Botanical Garden, also of the Herb Society of America, and the author of "Gardening with Herbs for Flavor and Fragrance" and other books, served as chairman of the two-day meeting and presided on the afternoon of the first day. Mrs. Robert H. Fife, President of the Advisory Council, presided on Tuesday morning after a brief introduction by Dr. William J. Robbins. Dr. C. W.

*An article based on Dr. Bonisteel's paper appeared in the April Journal of the New York Botanical Garden.

Ballard, Dean of the College of Pharmacy at Columbia University, took the chair the second morning, and Miss Elizabeth Remsen Van Brunt, a member of the New York unit of the Herb Society of America, presided Wednesday afternoon.

Herbs in Food

Following the opening talk, in which Mrs. Fox gave some practical advice for the culture of a garden to contain useful herbs for making teas, flavoring foods, and providing pleasant odors, Miss Edith M. Barber, who is a nutrition expert, a student of the history of foods, and author of numerous books, as well as the Food Editor of the New York Sun, spoke on "The Use of Herbs in Cookery." Going back 1700 years for the first authentic records of the use of herbs, she told about the 12-foot asparagus mentioned by Athenaeus. Aristotle also wrote of asparagus, she said, as well as of capers, pennyroyal, thyme, sage, and rue, and another early Greek writer mentioned beet, mallow, sorrel, nettle, orach, bulbs, and truffles as wild vegetables fit to boil. (There was no distinction made then between what we now know as vegetables and the savory herbs. All alike were classed as herbs.) Spices and other herbs mentioned in this period include pepper, myrrh, sesame, cumin, and coriander.

From Apicius* Miss Barber quoted a "jelly" which made use of many herbs.

> Put in the mortar celery seed, dry pennyroyal, dry mint, ginger, fresh coriander, seedless raisins, honey, vinegar, oil and wine, crush it together. Place 3 pieces of Picentian bread in a mould, interlined with pieces of chicken, sweetbreads of calf or lamb, cheese, pignolia nuts, cucumbers, finely chopped dry onions, covering the whole with broth. Bury the mould in snow up to the rim, sprinkle and serve.

The publishing of herbals after the invention of the printing press, Miss Barber pointed out, marked a great revival of interest both in gardening and in cookery upon Europe's emergence from the Dark Ages. But there was still no distinction between herbs and vegetables, and greater attention was paid to the supposed medicinal qualities of plants than to their use as food. The change to today's terminology did not take place until the latter part of the 16th century, when Thomas Tusser wrote his "Five Hundred Points of Good Husbandry." The few cookbooks which remain from this period mention rosemary, parsley, thyme, ginger, cinnamon, and sugar (which was then classed as a spice), and the flowers or buds of borage, rose, and violet.

The 17th century brought the first recipe for salad into print, John Evelyn being the author. It should be a mess of raw vegetables, he said, well seasoned with oil and vinegar. In addition to the ordinary vegetables and greens, he suggested daisies, gilliflowers, hop buds, and nettles. Salad herbs which he had in mind included parsley, purslane, rosemary, sage, sorrel, tansy, fennel, mint, and tarragon.

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*But not the same Apicius who is said to have committed suicide when, having only a half a million or so of his fortune left, could not bear to face life with so little to spend on luxuries for his table.

There is little change from these in the 20th century. Our colonial ancestors, Miss Barber remarked, apparently used very few flavoring herbs in their cookery. Consequently there are almost no historic American recipes containing herbs. While recommending herbs as accessories in cooking, she warned against using them in too great abundance and in indiscreet combinations.

"A fine palate is necessary for the use of herbs in cookery," Miss Barber concluded. "The rule is, 'Season to *good* taste.' "

Spices from the Far East

Travels in the spice-producing lands of the Far East formed the background for the address by Mr. M. L. Van Norden, President of Van Norden & Archibald, importers of spices, and vice chairman of the publicity committee of the American Spice Trade Association.

It was the lure of a shorter route to the Spice Islands toward the end of the 15th century, Mr. Van Norden reminded his hearers, that caused Columbus to stumble on America. "It is because of spices," he said, "that we are all here today."

The Chinese, however, who were well established in the trade by 2700 B.C., were the first spice dealers in the world, he pointed out. Four thousand years ago they are known to have dealt with cloves, which, because of their shape, they called the "chicken-tongue" spice. Later the French gave the name of "clou," meaning nail, to this same product, and our word *cloves* is derived from this.

In the days of caravans, before a sea route was sought, Venice, which was then a country by itself, was the great European spice center. "The spice caravans passing perilously through India and what was then Persia, up through various countries to Alexandria, finally reached Venice," Mr. Van Norden explained. "It was then that it really meant something to be a 'Merchant of Venice.' The immense wealth of Venice that resulted was what fired the jealousy of Spain and Portugal, which in time sent Columbus, Magellan, and Da Gama to discover the secret of the Spice Islands."

Mr. Van Norden told many stories about spices as he has seen them growing and being gathered in the Far East for shipment to America. "People ask me why spices don't grow everywhere where the climate is similar," he remarked. "I tell them no one really knows, but superstition has it that cloves, for instance, must 'see' the ocean and nutmegs must 'smell' it."

Indian Medicine

So far as medicinal plants are concerned, Mr. G. L. Wittrock, speaking on "North American Indian Customs with Medicinal Plants," expressed the belief that further investigations into the nature of some of the plants that were used by the Indians would reveal useful drugs that might

replace some of the products that we are no longer able to get because of the war. Many of the facts he related about the Indians' use of native plants in medicine will be found in the article written by Mrs. Wittrock in collaboration with him and published in the March issue of the Journal.

Essential Oils

Dr. Ernest S. Guenther, Chief Research Chemist for Fritzsche Bros., Inc., of New York City, gave the talks accompanying the two motion pictures which his company provided for the conference. Both films were made by Dr. Guenther during his travels into the regions of the world where essential oils are produced from native plants. One of them shows the production of essential oils in the Western Hemisphere; the other in the Far East.

* * *

Other addresses were given during the conference by Dr. W. M. Porterfield, who spoke on "China's Contribution in Medicinal Herbs;" Dr. Henry K. Svenson, whose subject was South America's contribution; Miss Mala Rubinstein, "Herbs in Cosmetics;" and Mr. Christian Wight, "Herbs in Perfumery." These papers—or significant portions of them—will be published in later numbers of this Journal.

The Audience

Among the individuals who attended the two-day conference were, besides amateur gardeners and persons with herbs as a hobby, growers of herbs and dealers in herb products, professors of botany and related subjects, research botanists and other scientists, high school teachers, garden club officers and members, professional horticulturists, landscape architects, writers, editors, lecturers, and radio speakers, and people who work with foods. Many, in addition, were members of the Botanical Garden; others, members of the Herb Society of America, the New York unit of which, under the chairmanship of Mrs. William Felton Barrett (who is also a member of the Garden's Advisory Council), served as hostess organization for the luncheon served each day. While approximately half of those attending came from New York City, probably another 75 from other places in New York State, one registered from Kansas, and others made special trips to New York from Ohio, Wisconsin, Michigan, Missouri, Virginia, District of Columbia, Pennsylvania, New Jersey, Connecticut, Massachusetts, Rhode Island, New Hampshire, and Vermont, as well as other states.

The Hostesses

Members of the Herb Society of America who took charge of the luncheon on the two days included, besides Mrs. Barrett, Miss Elizabeth Remsen Van Brunt, Mrs. Edward M. Colie, Mrs. Jay B. Odell, and Mrs. Henry Rennell. Several members of the Advisory Council of the Garden who are also members of the Herb Society

also assisted at noon, as well as in arranging and serving the tea at the close of the program each afternoon. This group of hostesses included Mrs. Robert H. Fife, as chairman, Mrs. Nelson B. Williams, Mrs. Antonie P. Voislawsky, Mrs. Elon Huntington Hooker, Mrs. John Ross Delafield, Mrs. Barent Lefferts, Mrs. Henry F. Schwartz, Mrs. Mortimer J. Fox, Mrs. Jerome W. Coombs, and Mrs. A. Barton Hepburn. Also assisting were Mrs. William J. Robbins, Mrs. H. W. Rickett, Mrs. F. W. Kavanagh, Dr. Roberta Ma, Mrs. Mary Bartley Schmidt, Mrs. Lazella Schwarten, Mrs. G. M. Schilling, and Miss Rosalie Weikert. General arrangements were handled by Miss Elizabeth C. Hall.

Notes, News, and Comment

Scholarship. Mary Bartley Schmidt came to the Garden in April to work for a year with Dr. B. O. Dodge on the genetics involved in heterocaryotic vigor in the bread-mold fungus *Neurospora.* Her work will consist of making crosses between two races, one a dwarf and one a subnormal one, to make a study of the first and second generation hybrids. When the nuclei of these two races are thrown together in common cytoplasm, it has been observed, the mycelium grows with great vigor, exhibiting a phenomenon comparable to hybrid vigor in the higher plants. Mrs. Schmidt is the recipient of a scholarship from the American Philosophical Society.

War Job. Dr. William J. Bonisteel began a wartime assignment the last of April under the direction of Nelson M. Rockefeller, Co-ordinator of Inter-American Affairs, as special consultant on the production of drug crops. His work will take him into many South American countries. During his absence from Fordham University the remainder of this term, his students in General Botany are being taught by Dr. H. W. Rickett.

Chrysler Herbarium. Upon his retirement from the Botany Department at Rutgers University, where he has been since 1923, Prof. M. A. Chrysler was honored April 16 at a ceremony in which the institution's collection of preserved plant specimens was named the Chrysler Herbarium. Dr. W. H. Camp gave the principal address, speaking on "The Herbarium in Systematics." As Research Professor Emeritus, Dr. Chrysler plans to continue his taxonomic work on tropical ferns.

War on Beetles. Chinese Boy Scouts of New York City visited the laboratory of Dr. B. O Dodge on April 4 and heard a talk on Japanese beetles, after which they studied the grubs which were found still wintering just beneath the sod in the lawns. They have volunteered to help in eradicating the Japanese beetles from the New York City area this coming summer.

Advisory Council. Dr. William J. Robbins conducted members of the Garden's Advisory Council on a tour of the grounds, explaining plans for their development, after the business meeting of the group held in the Members' Room April 13.

Torrey Club. Dr. Edwin B. Matzke of Columbia University and Mr. R. L. Hulbary addressed the Torrey Botanical Club at the Garden April 15 on "Microscopic Anatomy in the Identification of the Commercial White Pines" and Mr. Libero Ajello spoke on "A New Chytrid Genus, *Polychytrium.*" Thirty-five were present for the meeting and tea which followed in the Members' Room.

Students. The Museum of Fossil Botany in the basement of the Museum Building was visited by students from Hunter College March 28 under the direction of Miss J. L. R. Simpson. Two classes from the Department of Landscape Architecture at Columbia University under Howard R. Sebold studied plants in the Thompson Memorial Rock Garden April 24.

Nature Study. The Botanical Garden was represented at a Nature Curator Conference of the New York City Board of Education, held at the American Museum of Natural History April 23, by Carol H. Woodward, who spoke briefly on the Garden's demonstration vegetable garden and the courses of study. Miss Dorothy Oak was also introduced at the meeting as one of the ten instructors in the Emergency Nature Lecture Course.

Lectures. During a visit to Cornell University April 10 for the initiation and banquet of the Society of Sigma Xi, Dr. William J. Robbins gave two talks, one on "Plant Life at the New York Botanical Garden" to the society, and one on "Vitamins in Plant Growth" to the class in advanced plant physiology.

Gardeners Forum. The seventh annual dinner of the Gardeners Forum took place April 11 at the Bronx River Inn, with Mr. Roland Schultheis, Superintendent of Flushing Cemetery, and Mr. J. H. Beale, Superintendent of the Arboretum at the Boyce Thompson Institute, Yonkers, as principal speakers. T. H. Everett served as toastmaster. Theodore J. O'Lack, Secretary of the Forum, was the recipient of a set of Britton & Brown's "Illustrated Flora of the Northern United States and Canada," presented by Dr. W. J. Robbins, as a prize for the best herbarium of the native flora made during the year by a student gardener. Among the guests were two representatives from the armed forces of the United States—Sergeant Harold Davidson of the U. S. Army, a former student gardener, and Seaman Harry Ford of the U. S. Navy, a former apprentice. The committee for the banquet consisted of Mr. O'Lack, Miss Anne Seaman, and Vincent Walsh.

Flood Control. Word from Dr. H. N. Moldenke, who is at Civilian Public Service Camp No. 23 at Fresno, Ohio, indicates that he is in charge of taxonomic work involved in the study of plants for areas under observation for flood control work in the Northern Appalachian Experimental Watershed, a division of the Soil Conservation Service of the U. S. Department of Agriculture.

Tree Pictures. Because of the postponement of the publication date from May to August, for "Trees of the Countryside" by Margaret McKenny, the exhibit of tree pictures made for the book by Alice Bird, originally scheduled for this month at the Botanical Garden, has also been postponed until August.

Visitors. Among the spring visitors at the Garden were Robert Bloch, Yale University; Edna Kobs, Randolph-Macon Women's College; Elbert L. Little, Jr., U S. Forest Service; and Arthur J. Eames, Cornell University.

Cup-Fungi. Dr. Fred Jay Seaver is the author and publisher of a new supplemented edition of "The North American Cup-Fungi (Operculates)," the original edition of which appeared in 1928. Containing 377 pages in contrast to the 284 pages of the first edition, the new volume also has four new plates in color, as well as many other additional illustrations. The book, which is attractively bound in blue, came off the press Jan. 31. A review of it will appear in a later number of this Journal.

Mosses. Mrs. Inez M. Haring has returned to New York from Poughkeepsie to spend the summer working in the Elizabeth Gertrude Britton Moss Herbarium.

Liverworts. Dr. Margaret Fulford, who has been working at Yale and Harvard since the first of the year, doing research on the liverworts, particularly those of Central America, in lieu of the expedition to Central America for which she was ready to start the week that America entered the war, has returned to the Garden to complete her year of work on a Guggenheim Fellowship. She will return to her post as Assistant Professor of Botany at the University of Cincinnati in September.

Air Service. Dr. Duncan A. McLarty, Instructor in Botany at Dartmouth College, who was a visitor last summer at the Garden, has resigned to join the meteorological branch of the Canadian Air Service. Replacing him is Arthur B. Hillegas who in the summer of 1940 received a scholarship at the Garden.

Honors. At their first meeting of the year, the Board of Directors of the Horticultural Society of New York unanimously reelected Dr. W. J. Robbins a director for the term 1942-1944.

Miss Elizabeth C. Hall was voted an honorary member of the North Suffolk Garden Club of Long Island, which is a member of the Garden Club of America.

Prizes. Two annual botany prizes for original investigation by undergraduate students have been established at Dartmouth College in memory of William W. Eggleston, through a fund presented by Mrs. Eggleston. In 1904 Mr. Eggleston, who had been a civil engineer, came to the New York Botanical Garden as a research scholar and later worked in the United States Department of Agriculture as assistant botanist.

Current Literature At a Glance*

For Vegetable Gardeners. Among the many new books and booklets prepared for the growers of vegetables is "Victory Backyard Gardens" prepared by T. H. Everett for the Whitman Publishing Co., and offered for sale in ten-cent stores throughout the country. Subtitled "Simple Rules for Growing Your Own Vegetables," the book contains chapters on locating and planning the vegetable garden, tools, hotbeds and coldframes, preparing the soil, sowing and planting, summer care, harvesting and storing, and control of pests. Culture of individual crops is treated by Edgar J. Klissold and fruits and berries are handled by E. J. Werner. Tables are provided from the U. S. Department of Agriculture's various publications and from the Consumers' Guide. There is an introduction taken from an address by Claude R. Wickard, Secretary of Agriculture. The book is abundantly illustrated with drawings by Tabea Hoffman.

Herb Culture. Much practical information for the beginner in herb gardening is contained in "Herbs and Their Culture" published as Circular 149 of the Connecticut Agricultural Experiment Station in New Haven. While it has been prepared especially for residents of Connecticut, the booklet will also be distributed free to persons in other states as long as the supply lasts.

Essential Oils. Reprints of more than 50 papers written by Ernest S Guenther and appearing in eight different technical magazines have been presented to the library of the New York Botanical Garden by Fritzsche Brothers, Inc., for whom Dr. Guenther is Chief Research Chemist. The papers cover nearly 14 years of travel, industrial investigation, and chemical research, all in the field of essential oils. Another product of these years has been the motion pictures made by Dr. Guenther showing phases of the essential oil industry, two of which were presented by him during the Garden's Herb Conference in April. He has written about the production of essential oils in France, Belgium, Spain, Italy, Sicily, Bulgaria, Hungary, Dalmatia and the Tyrol, portions of Africa, Madagascar, Ceylon, the Philippines, Java, South America, Mexico, California, and other places. The essential oils that he has treated in this series of reprints, which are beautifully illustrated, mostly with his own photographs, include the citrus oils, also clary, lavender, linaloe, bois de rose; bay, caraway, carrot, parsley, and celery; juniper, cypress and cedarwood; lemon-grass, geranium, star anise, and sweet basil; vetiver, ylang-ylang, palmarosa; pepper, pimenta, and cinnamon; citronella, hyssop, myrtle, rose, vanilla, sandalwood, labdanum, and the oils that are contained in French cognac.

Mushroom Pests. The commercial, also the amateur, grower of mushrooms will learn how to keep the beds free from the various flies, mites, and other pests that attack the crop by studying Circular 457 of the U.S.D.A. on "Mushroom Pests and Their Control" Copies are obtainable from the Superintendent of Documents in Washington for 10 cents.

Narcissus Pests. Control of the narcissus bulb fly, which in recent years has done great damage in narcissus-growing areas, is explained in Farmers' Bulletin No. 1890 of the U.S.D.A. Illustrations, diagrams, and descriptions are also given for the control of other narcissus pests. Price 10 cents, obtainable from the Superintendent of Documents.

New Jersey Weeds. One by one the states are issuing booklets on their weeds. The latest comes from New Jersey as Circular 416 of the Agricultural Experiment Station. It was prepared by Jessie G. Fiske. Each weed described is illustrated.

Pruning. Photographs and sketches showing fruit trees, vines, and shrubs before and after they have been pruned are used to explain methods of handling hardy fruit plants in Farmers' Bulletin No 1870 of the U.S.D.A.

Iowa Plants. More than 100 pages of keys by which the plants of Iowa may be determined comprise a booklet prepared and published by Henry S. Conard, Professor of Botany at Grinnell College. This is the fifth edition of the "Grinnell Flora."

* All publications mentioned here -and many others—may be found in the Library of The Botanical Garden, in the Museum Building.

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PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner in plant identification. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 figures, covering algae, fungi, mosses, ferns, flowering plants. 1918. $3.50

A Text-Book of General Lichenology, by Albert Schneider. 230 pages. 76 plates. 1897. $2.50.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50; unbound $15.50.

Keys to the North American Species of Carex by K. K. Mackenzie From Vol. 19, Part 1, of *North American Flora.* $1.25.

Plants of the Holy Scriptures by Eleanor King, illustrated, and accompanied by a list of Plants of the Bible with quotations, in the March 1941 Journal. 15 cents.

Food and Drug Plants of the North American Indian. Two illustrated articles by Marion A. & G. L. Wittrock in the Journal for March 1942. 15 cents.

Hardy Ferns and Their Culture. Edited by Carol H. Woodward. 40 pages, illustrated: bound in paper. 1940. 25 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward. 28 pages, illustrated with photographs and drawings; bound with paper. 1941. 25 cents.

Vegetables and Fruits for the Home Garden. Four authoritative articles reprinted from the Journal 21 pages. illustrated Edited by Carol H. Woodward. 1941. 25 cents.

An Herbal. First published by Richard Banckes in London. 1525. Edited and transcribed into modern English with an introduction by Sanford V. Larkey, M.D., and Thomas Pyles. 200 pages, including facsimile of original. Prepared by Scholars' Facsimiles and Reprints. 1941. Price to members of the Garden, $2.50; to others, $3.50.

Periodicals

Addisonia, annually, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Now in its twenty-first volume. Subscription price, $10 a volume (four years). Not offered in exchange. Free to members of the Garden.

Journal of The New York Botanical Garden, monthly, containing news, book reviews, and non-technical articles on botany and horticulture. Subscription, $1 a year; single copies 15 cents. Free to members of the Garden. Now in its 43rd volume.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $7 a year; single copies $1.25 each. Now in its thirty-fourth volume. Twenty-four Year Index volume $3.

Brittonia. A series of botanical papers. Subscription price, $5 a volume. Now in its fourth volume.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. Planned to be completed in 34 volumes, each to consist of four or more parts; 90 parts now issued. Not offered in exchange. Prices of the separate parts on request.

Contributions from The New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each, $5 a volume. In the 14th volume.

Memoirs of The New York Botanical Garden. A collection of scientific papers. Contents and prices on request.

JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

VOL. 43 JUNE IN TWO PARTS: PART I

NO. 510 1942 PAGES 141—164

JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

HOW THIS JOURNAL IS AIDED

AMONG the numerous funds for special purposes which have been presented or bequeathed to the New York Botanical Garden during the past 43 years, two have contributed to the publication of this Journal One of these is the David Lydig fund of $34,337.86 bequeathed by Charles P. Daly in 1899, in memory of Mrs. Daly's grandfather The income from this fund, by action of the Board of Managers, is applied exclusively to the Garden's publications.

Both Mr Lydig and Judge Daly died before any of the Garden's current publications were established. The Bulletin, Contributions, and Memoirs, now no longer published, were started in 1896, 1899, and 1900, respectively. The Journal was begun in January 1900. The first number of North American Flora was issued May 22, 1905. Mycologia, which has since become self-supporting, was inaugurated in 1908. Brittonia, the youngest of the publications, was started in 1931. (Addisonia, established in 1916, is taken care of by a fund of its own.)

Each of these periodicals has, of course, received from this fund only a fraction of the money it has needed every year. There has been a steady hope that more such funds will be presented, so that each publication can be assured of a strong financial basis, which now is sadly lacking except as money is appropriated yearly out of income from the general endowment of the Garden.

Besides the David Lydig fund, part of the income from the Stokes fund, established in 1901, is used occasionally for this Journal. Known as the Olivia and Caroline Phelps Stokes Fund for the Protection of Native Plants, and totaling $5,030.63, it contributed greatly in its early years to arousing interest in the preservation of wild flowers. In 1912 and '13 the accumulated income was used for colored illustrations of wild flowers needing protection. These appeared as frontispieces in the Journal.

Whenever articles in the Journal deal with native plants, either giving information about them (which was one of the stated purposes of the fund) or pleading for their protection, it is with the aid of the Stokes fund that this material is published

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Cover Photograph Fleda Griffith

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Looking Into A Banana "Tree"

Structure and Growth of the World's Largest Herb Revealed

By H. W. Rickett

A BUNCH of bananas grows on a plant which some would call a banana tree. A tree it is indeed in stature, but botanically more accurately spoken of as a gigantic herb. After it has fruited, the massive trunk, the enormous leaves—all the visible structure—dies down to the ground as if it were no more than a carrot-top.

Like the leaves and flowering stem of that familiar vegetable, the green parts of the banana arise from an underground part. This is a stem, however, not a root; and it continually produces new branches which in turn form new aerial shoots. The banana is perennial.

Each branch of the underground stem of a banana is known to planters as a bulb, but in structure it is quite unlike the bulb of a lily or tulip. Botanically it is spoken of as a RHIZOME, though it is less elongated and more swollen than the usual rhizome and it is finally directed upward in its growth rather than horizontally. Perhaps that botanical factotum, the term TUBER, may be used to designate such a structure.

Each tuber is tipped with a bud, composed of young leaves closely grouped on a growing point called the MERISTEM. The bud becomes the leafy shoot and from its apex the flowers and fruit develop; after the fruit has been formed the entire shoot dies.

Also in the bud there are lateral buds which will form the next crop of tubers, one or more of which will give rise to new shoots. The relation of these lateral buds to the leaves is of some interest. It is well known that lateral buds of plants regularly appear in the axils of the leaves – that is, in the angles between leaves and stem. Each lateral bud of a banana shoot, however, stands on the side of the stem *opposite* a leaf-base. The explanation is probably as follows:

When the first leaf appears below the terminal growing point, or meristem, a lateral meristem is formed, as usual, in its axil. The terminal meristem then becomes dormant and the growing point in the axil replaces it, pushing up past it and leaving it on one side -opposite the point of origin of the leaf. The originally lateral meristem thus becomes in effect terminal, while the originally terminal meristem, which has been pushed to the side during its dormancy, becomes the lateral bud. The same story is repeated when the next leaf is formed, and the next; so that the apparently continuous axis is a series of axillary branches, known as a SYMPODIUM. Such axes are common in the flower-clusters of many families. (The forget-me-not and the spring-beauty are two familiar examples.)

One of the interesting features of the tuber is the presence of a growth region near its summit which recalls the cambium of dicotyledonous plants. It is particularly concerned in the formation of the roots, which break out even through the bases of the older leaves.

The growing-point (meristem) at the apex of the tuber is at first flat, its leaves attached nearly on the same plane in concentric circles, the oldest on the outside. Each leaf forms an almost closed cylinder which surrounds all younger leaves; the midribs of successive leaves are distant from each other about two-fifths of the circumference of the circle. As each new leaf is formed it pushes up through the sheathing base of the previous one and emerges from its apex, its unrolling blade overtopping all that preceded it. The entire tuft of leaves is comparable to a young corn plant about July 4: no true stem is visible above the ground, only leaves whose bases are rolled one within the other to simulate a stem. The apparent trunk of the banana plant is generally called the PSEUDOSTEM—false stem.

After several leaves have been formed the flat stem-tip within them begins to elongate, thrusting up through the center of the cylinder of leaf-bases. It becomes a massive white column which occupies about one-third of the diameter of the pseudostem. As it grows it continues to form leaves which emerge through the sheaths of the older ones exactly as do those which are attached to the tuber. Finally the growing-point develops into the cluster of flowers which protrudes from the summit of the apparent trunk.

There has been some tendency in popular and semi-scientific literature to treat the trunk of a banana "tree" as nothing but a cylinder of leaf-bases surrounding an immense leafless flower-stalk (SCAPE). This is far from the truth. The stem within the pseudostem is leafy for about three-fourths of its height. It is not unique in being surrounded by leaf-bases; this is true also of many palms, and even of some herbs; a celery plant, in fact, has a similar but looser pseudostem. The banana plant is notable for the excessive proportion of leaf-bases to true stem, and for the weakness of the latter. The stem is composed almost entirely of PARENCHYMA –large, soft, thin-walled cells—in which there are numerous air-filled spaces. There are large numbers of small conductive strands, particularly in the

LOOKING INTO A BANANA TREE

This photograph was made in the Main Conservatories at the Garden by David Eisendrath, Jr., of the newspaper PM, *in early spring a year ago, and it appeared as a full-page illustration in the paper. The other photographs used here, made by Fleda Griffith, show sections of the same banana plant after it was cut down a few weeks later.*

A piece of the pseudostem dissected to reveal the soft central core and the sturdily constructed leaf-bases which form the strong "trunk" of the "tree."

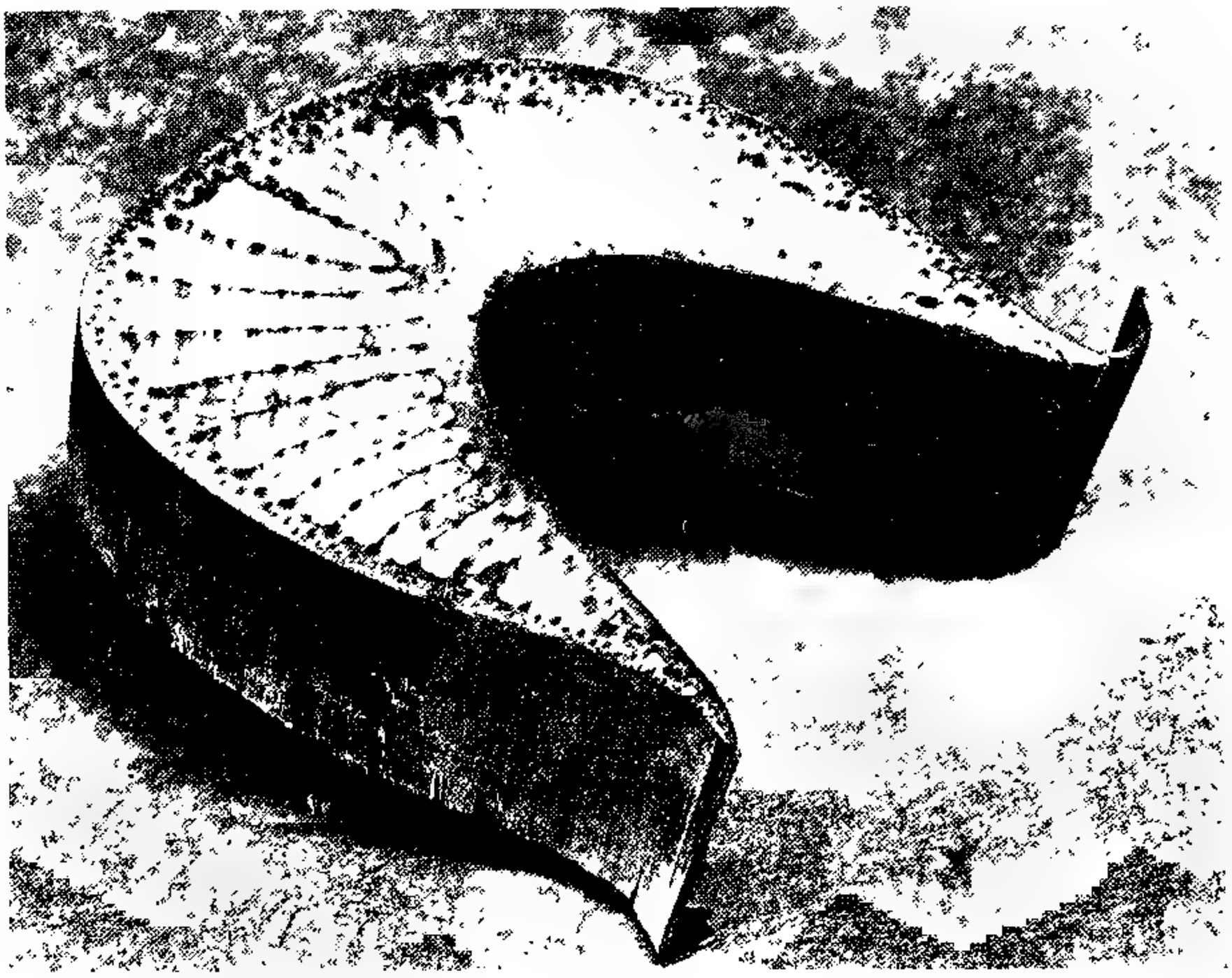
outer or cortical region; but practically no woody fibers. If divested of its protective sheath, the stem could not support its own weight, much less that of the fruit hanging from its tip. Anatomically it is a stem, but structurally it has yielded its functions to the pseudostem.

The leaf-base is responsible for the support of the leaf, and, united with its fellows, for that of the stem and fruit-cluster. It may extend from the tuber under the ground to the stalk which supports the leaf-blade thirty feet above. Like so many large parts of herbaceous plants, it is an example of the economical use of structural tissues. It is composed of a tough rind on outer and inner surfaces connected by narrow partitions which run the entire length of base and stalk. The spaces between these, normally filled with air, are not continuous, but interrupted by transverse walls, or SEPTA (one would be called a SEPTUM). The whole structure depends for its strength, like an iron column, on the rigidity of its outer

wall. The main partitions, which are extended perpendicularly to the direction in which bending is likely, serve to keep the two surfaces apart. Conductive strands run the entire length of the partitions and are numerous in the tissues near the epidermis; they are joined by frequent cross connections at the levels of the transverse septa.

A cross section of the trunk of a banana plant therefore reveals a central core of soft tissue, the stem, surrounded by interlocked tough-walled and cross-ribbed crescents, the leaf-bases. If the sheath of leaf-bases is split open, segments of the stem can be lifted out of the cylindrical cavity in which it fits so snugly.

Cross section of the pseudostem of a banana, showing the central core, or true stem, surrounded by the leaf-bases, in which the air chambers are visible. The dark dots in the central core are the vascular bundles which carry the sap to the leaves and flowers above.



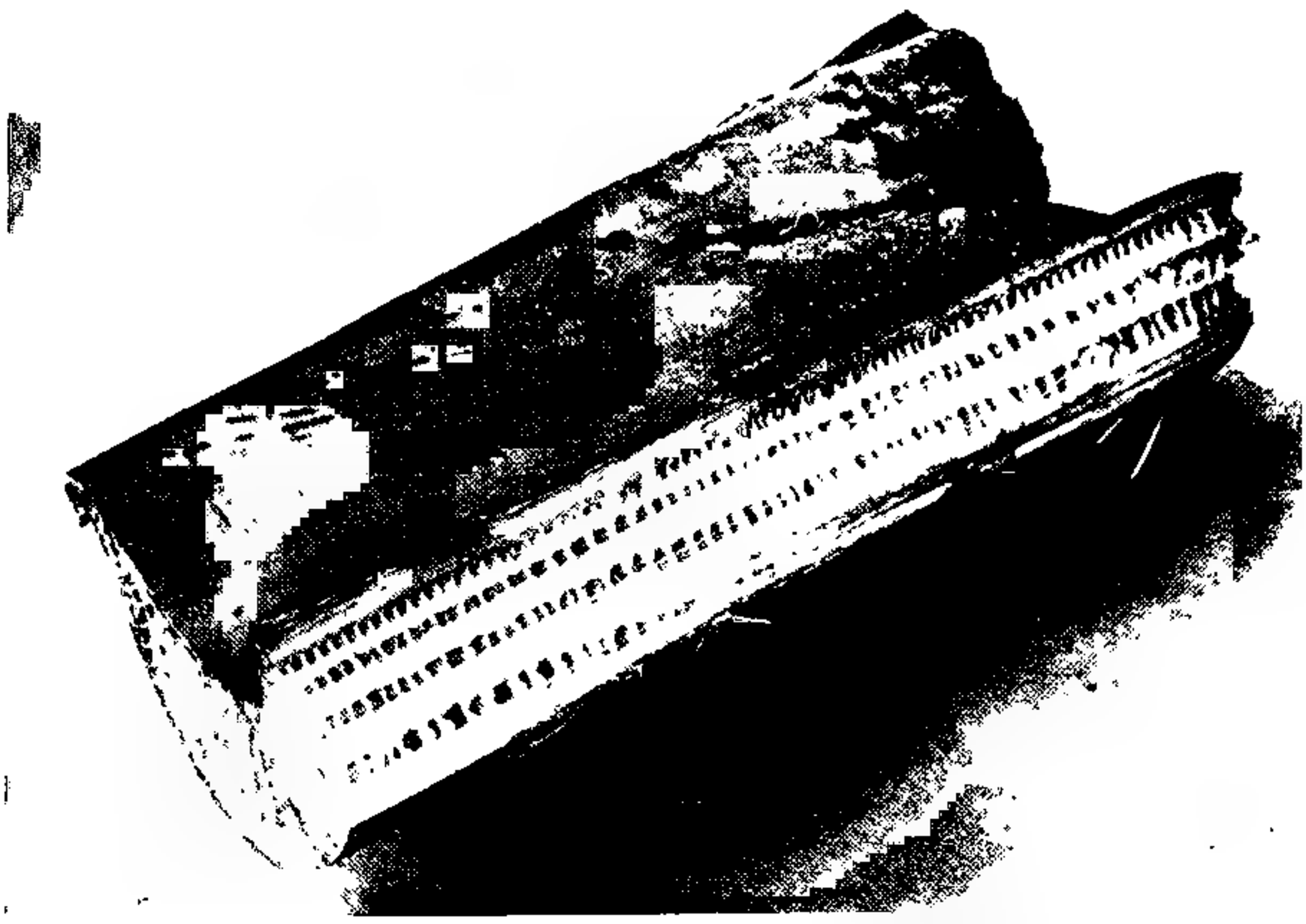
Leaf-stalk in cross-section, showing the longitudinal partitions and the transverse septa interrupting them. These partitions, or ribs, always separated by air spaces, run the entire length of the leaf. The streaks in the walls of the partitions are the vascular bundles

The blade of a banana leaf is "one of the largest unbroken expanses of photosynthetic tissue in the entire plant kingdom."* It is remarkable that such an enormous leaf can get itself up through the tightly rolled pseudostem and spread out its great blade without being torn and crumpled. The two halves of the blade, before they emerge, are rolled lengthwise, one half around the other and enclosing the midrib. At the tip is a tapering slender appendage, which is of interest because it has been shown to be the remains of the true petiole of the leaf. The banana leaf is a product of a long evolutionary history in which most of the petiole and all of the lamina, or blade, have disappeared (leaving only this vestige). The present blade is really an expansion of the upper part of the ancestral leaf-base, and its apparent petiole is a narrowed portion of the same structure. The evidence for this has come largely from a study of the veins. The stalk and midrib are continuous with the base, have the same

* Several leaves on the banana plant which fruited at the Garden in the summer of 1941 had blades 12 feet long and more than 3 feet wide.

arrangement of air chambers, the same disposition of vascular strands in the longitudinal partitions. These strands diverge into the blade (or give off branches which do so) and run transversely across to either margin, where they unite again into the marginal vein, which increases in thickness towards the apex. The effect is exactly that obtained by slightly spreading a lock of hair; and this is apparently what has happened in the history of the tribe to form the false lamina of the leaf. A true blade develops by marginal growth, not by an expansion of the tissues within the margin. Between the veins in the lamina of a banana leaf is a system of air chambers which continues that of the leaf base, interrupted in the same way by transverse septa. Since each row of chambers diverges to right or left, the septa are parallel instead of perpendicular to the midrib.

The unrolling of the gigantic blade is of interest. While it is still rolled up, its upper surface is quite smooth. Certain cells along the upper (inner) surfaces of the rolled veins absorb quantities of water, and the pressure thus generated unrolls the veins—and the blade with them. (The action is like that of a coiled paper tube into which you blow during certain celebrations.) On the surface of the expanded leaf the veins stand up as ridges. There are also strips of cells on either side of the midrib which,



Portion of leaf-stalk cut both crosswise and lengthwise to show the longitudinal partitions and the transverse septa, also the spongy nature of the whole.

by their expansion, bend back the two halves of the blade into one plane—as you open the journal in which these words are printed.

After it has opened, the leaf commonly becomes split between the transverse veins into "false pinnae"—segments which simulate the divisions of a pinnately compound leaf. The banana should be particularly dear to the teaching botanist, who delights to explain that a strawberry is not a berry and an apple not truly a fruit. The apparent stem of the banana tree is a pseudostem, its leaf-blade is not a leaf-blade, and its pinnae are false pinnae. For its fruit we are permitted to use the word berry.

The inflorescence emerges as a large conical bud enclosed in rather scale-like leaves. In the angle between each scale (bract) and the main axis of the cluster are one or two rows of flowers arranged transversely to the direction of growth and parallel to the surface of the axis. This also is obviously (like so many inflorescences) a type of structure which, in its evolutionary development, has been condensed from a widely branched cluster. The structure of the flowers is extremely complex. Those in the axils of the lower bracts (that is, those nearest the "trunk" of the plant, actually the upper ones as the inflorescence hangs downward) are perfect flowers and develop the fruits; each cluster becomes a "hand" of bananas. The flowers nearer the tip of the cluster have no pistils, only stamens, and consequently can mature no fruit. One by one their protecting bracts fall, and the flowers also; so that the ripening branch of bananas bears a pendent tail terminated by an ovoid pointed bud.

Herbs In Cosmetics

As presented April 7 at the Herb Conference at the New York Botanical Garden.

By Mala Rubinstein*

THE herb is the oldest and one of the newest ingredients of beauty products. Herbs were used for beauty by Cleopatra and other glamour girls of the Ancient World. And we use herbs in our cosmetics today. We use them in eye-packs to refresh our eyes; in shampoo for our hair; in oil for our fingernails and our eyelids. We use them also in many of our creams and lotions. In spite of all our modern chemical discoveries, we find that herbs are still among the most valued of ingredients for many beauty preparations. Herbs are as important today for health and beauty as they were 2,000 years ago.

Of course, it is not really correct to compare the herbs we use in our cosmetics today with those employed by the ancients. I am quite sure

* Miss Rubinstein is Director of the New York Salon of Mme. Helena Rubinstein.

Cleopatra would not recognize her favorite herbs as we make use of them today. And I am sure she would gladly have paid a heavy ransom for the modern beauty aids we take for granted.

Today, when we want to give our complexions the benefit of herbs, we simply use a fine, fragrant, herbal cleansing cream. But when the ladies of ancient Egypt wanted an herbal beauty treatment, they had to whip up a concoction like the following: "Gum of frankincense, wax, fresh balanites oil, rush-nut ground fine, put in viscous fluid and applied to the face every day." This was supposed to expel wrinkles from the face, according to an Egyptian papyrus, dated 1500 B.C. If they wanted to do their hair, they mixed together some ink-powder, stibium, myrtle, oil, dung of sayelle, and fat of hippopotamus and applied this mixture to their crowning glories.

The Egyptians had a remedy for dandruff, too: powder of ground and roasted barley, powder of roasted ammi (bishop-weed), and soft grease mixed together. This was applied to the scalp. But if it failed, they still did not give up hope. The next step in the treatment was to turn the head to the ground without applying any remedy to it, then anoint it with fish-oil on the second day, fat of hippopotamus on the third day, and laudanum on the fourth day.

In addition to these beauty recipes, women of ancient Egypt, Greece, and Rome used herbs for healing purposes also. In fact, they were so impressed by the health- and beauty-giving powers of herbs that they grew them in their own gardens.

Later on, we find herbs mentioned in the Bible. In Solomon's Song, there is the reference to "myrrh and frankincense, and all the spicy powders of the merchant" to anoint the body. And during the Middle Ages, the nuns and monks of the cloisters and monasteries used herbs as a method of healing. Mother Superior Hildegard wrote an interesting book covering the subject of herbs and their healing properties. Then, coming closer to our century, Queen Elizabeth in England inspired the ladies of her court to plant herbs for cosmetic purposes.

Many persons today can remember their own grandmothers making use of herbs in their beauty preparations. For in the Victorian Age, women took their beauty herbs very seriously. When the poet Richard Alison wrote: "There is a garden in her face where roses and white lilies grow," he probably did not realize that his words could be taken almost literally. Although our grandmothers did not use roses and white lilies for their cosmetics, they did use a wide variety of herbs and herb incenses. Looking through some of the old beauty books in Madame Rubinstein's large beauty library, I came across a number of herbal recipes that our grandmothers used to achieve "that schoolgirl complexion."

In one book, called "How to be Pretty though Plain," by Mrs. Humphrey, which was published in London in 1899, I found a delightful recipe for lipstick. Ladies of that day would take half an ounce of alkanet and three ounces of oil of almond. This they would place in an earthen vessel

and put it in a warm place to melt. In another container they would mix an ounce and a half of white wax and half an ounce of spermaceti and let this melt also. When it was liquid, they added it to the oil, and put in it twelve drops of attar of roses. The recipe directs: "Stir the mixture until it is thick, and put in a cool place to get cold." Can you picture a busy woman of today going through this routine every time she needed a lipstick?

Victorian ladies considered orris root tablets excellent for a mouthwash and they followed this recipe for tooth powder: "One tablespoon of prepared Californian borax, an ounce of precipitated chalk, half an ounce of powdered orris-root, and one dram rose pink. Mix well together by aid of pestle and mortar. A most fragrant and pleasant preservative for the teeth and sweetener of the breath."

I was rather surprised to learn how they achieved the fashionable Victorian pallor, for I always thought they just covered their faces with quantities of white powder. But it seems that they went even farther than that. They drank dill-water which they earnestly believed took the color out of their cheeks.

My favorite Victorian ritual is the one which was used after sunbathing. On those rare occasions when Victorian ladies exposed their delicate skins to the sun, they followed these directions: "For the sunscorching, after boating or bathing, wash your face in water as hot as you can bear it, with some extract of elder-flowers in it, or a dessert-spoonful of the best glycerine."

However, although these early methods may seem rather primitive to us, we must give our predecessors credit for recognizing the beautifying properties of herbs—and making good use of them. As we learn more and more from modern science, we develop a greater respect for the knowledge of earlier periods.

In our own laboratories, we have considerably expanded the use of herbs, and we use thirty to forty different kinds in lotions, masques, and creams. I have selected a few of the more important ones which we use in beauty preparations. To begin with there is wild chamomile (*Matricaria Chamomilla*). This herb is extensively used in the making of cosmetics. Aside from its good aroma, its volatile oil is used to produce better circulation of the blood vessels of the scalp. The Roman chamomile (*Anthemis nobilis*) is also used in rinsing the hair to give it nice gloss.

The rosemary (*Rosmarinus officinalis*) is added to several cosmetic products because of its distinctive fragrance. It was used in the first Eau de Cologne ever manufactured. Everyone knows Ophelia's line: "There's rosemary . . . that's for remembrance."

The sage (*Salvia officinalis*), like rosemary, is another herb mentioned by Shakespeare, but he gives it a poisonous significance, whereas in reality this harmless little plant only has a bitter taste. "How similar are herbs

to life!" It has a delightful fragrance and disinfecting qualities when used in mouth washes and gargles. Every woman appreciates sage in the kitchen, but seldom realizes that it also may serve among her toiletries.

The fluid extract of the leaves of the wild pansy (*Viola tricolor*) is used in some of our new creams. It contains healing properties for several kinds of rash. Some continental physicians have written about their success in using wild pansy extract. A tincture of marigold (*Calendula officinalis*) is used in homeopathic medicines for countless ailments, but we cosmeticians like the flower particularly on account of its rich golden-orange color.

Nettle (*Urtica dioica*) is really only a weed among plants, but it is used very efficiently in certain cosmetics: for instance, as an ingredient in a hair wash, diluted in the right proportion. Sebastian Kneipp deserves the thanks of the world for this discovery, and he has many followers of his theory of the benefits of the nettle.

Eyebright (*Euphrasia officinalis*) is another weed. Farmers dislike it —they call it a parasite living on other plants, and say it is a cause of reduction of fodder for cattle. But as an herb for beauty it has been in use for centuries. The tincture of eyebright is used as an eyewash and it successfully combats inflammation of the eye. *Euphrasia* is Greek, meaning Cheerfulness. We don't know whether the herb is so called on account of its charming little flowers or the cheerful results obtained from it.

Fennel (*Foeniculum vulgare*) is mentioned in the book "Capitulare de Villis" written by Charlemagne's son Louis, who gives us in this the first instructions on how to cultivate fennel. From that time on this aromatic herb and spice was planted in all the gardens of the cloisters of Europe. It is used frequently for its fragrance, and it makes a helpful gargle and eyewash.

The rose, of course, is not strictly an herb, but because of the frequent use of the Queen of Flowers in the cosmetic field, I mention it here. Roses are used in the making of many perfumes and other products. We would be at a loss without rose flowers, oil, and rose water. Much has been written about how the Romans imported roses from the shores of the Nile. They used the scorched rose petals as a cosmetic for eyebrows. "Roses are strewn on the path of life, lengthen our stay in this world of strife."

Melilot was an herb used by Queen Elizabeth in the 15th century in her beauty culture. Arnica, peppermint, spearmint, and lavender are other herbs used for cosmetics. Our chemists and pharmacologists are continually working on the effect that various herbs have on the skin, to freshen, to rejuvenate it, and on the use of herbs for the hair, as a mouth wash, and in the care of the teeth.

Plant Life And The Law Of Man

III. Barberry Eradication

By E. H. Fulling

IN 1865 Anton de Bary, the great German botanist, put the finishing touches to a series of investigations by himself and others which established one of the most significant truths in the biology of plants, namely, that barberry bushes play an important role in the life-cycle and dissemination of wheat rust. In many parts of the Old World where wheat and certain other cereal crops had long been cultivated, black stem rust had wrought havoc for centuries, and proper understanding of the cause was not acquired until these investigators revealed the true nature of the scourge. In short, their revelations showed that the rust on wheat and a disease prevalent on barberry leaves both sprang from the same agency, a fungus which spread from wheat to barberry and from barberry to wheat, and that the presence of barberry was necessary for the dissemination of the disease in grain fields.

With slight modification, this explanation has withstood repeated investigation since it was first announced. In has since been learned that the disease can, to some extent, over-winter on winter wheat in the mild climates of the southern United States and in Australia, for examples, and thus reappear year after year on the grain without intervention of barberry as an alternate host. In northern regions, however, barberry is necessary for perpetuation of the disease from one season to another, except where wind currents carry the spores from southern to northern regions as the season advances. This fact carries the general implication that if barberry bushes are not at hand, the disease cannot ravage cereal crops, and this, too, has been amply confirmed. As a result, legislation requiring eradication of barberry bushes in wheat-growing areas has been an important part of man's battle against this disease which threatens his food supply.

European Legislation

Particular interest attaches to the very first move in this direction for the simple reason that it was made more than 200 years before the cause of wheat rust was properly understood. For centuries the farmers of Europe had recognized a correlation of some sort between the blasting of wheat, as the condition induced by the fungus was called, and the presence of barberry. It was inexplicable to them, but the instances were so many and the proximity of barberry and blasted wheat so convincing, that in 1660 the French farmers around Rouen secured passage of a law requiring destruction of barberry bushes in the wheat areas.[1] Similar

[1] Stakman, E. C. Barberry eradication prevents black rust in western Europe. U. S. Dept. Agr. Circ. 269. 1923.

decrees may have been issued elsewhere in Europe during the 17th century, but the next records found appear 145 years later, when the province of Schaumburg-Lippe in Germany required by law that all barberry bushes be removed by December of that year. In 1815 the Bremen Senate ordered that all bushes within 165 meters of grain fields be eradicated. Prussia in 1880 took action and in 1920 Bavaria did likewise. By 1923 there were 25 laws and police orders in various political subdivisions of Germany directed toward elimination of the guilty plants.

France, meanwhile, had awakened to further need since the law of Rouen in 1660, and in 1888 the government permitted local administrative districts to proscribe barberry within their limits. In 1891 the Department of Eure-et-Loir made its own law.

Denmark, after a bitter quarrel which lasted more than 50 years, passed a law in 1869 which gave everyone the right to demand extermination of barberry bushes. This law was not very effective, but one which superseded it on Jan. 1, 1904, met the situation so well by requiring complete destruction of barberries, except in botanical gardens and a few other restricted areas, that Denmark has since served as the outstanding example of successful control of wheat rust by barberry eradication.

In 1882 a law was passed in Steiermark, Austria; in 1916, in Norway; and in 1920 by the Ministry of Agriculture of Hungary. In other European countries, especially England, eradication campaigns have been voluntarily conducted, and all efforts in Europe, voluntary and otherwise, toward control of wheat rust in this manner have been rewarded for the most part by marked success.

Early American Laws

When the English colonists came from Europe to America, they brought their favorite hedge plant with them as well as their seed for a wheat crop. The barberry (*Berberis vulgaris*) soon became naturalized, spreading from one region to another, and it was inevitable that the combination of wheat and barberry should bring trouble, for the fungus was imported with these cultivated plants. The colonists undoubtedly were not aware of the relationship among these three. It was not many years, therefore, before the New England wheat fields were blasted and the supplies of flour seriously threatened. Again many observations were made concerning the proximity of barberry bushes to infested fields. Finally the situation became so bad and the farmers so desperate that something had to be done to appease their wrath and offer a possibility of relief. The farmers, contrary to supposedly more learned opinion on the matter at that time, insisted that barberries had something to do with the terrible state of affairs. Under the strength of this conviction they eventually succeeded in securing remedial legislation in three of the colonies. It is to Connecticut that credit must be given for having been the first to act, for in 1726 the following law was passed:

An Act concerning Barberry Bushes.

Whereas the abounding of barberry bushes is thought to be very hurtful, it being by plentiful experience found that, where they are in large quantities, they do occasion, or at least increase, the blast on all sorts of English grain,

Be it therefore enacted by the Governour, Council and Representatives, in General Court Assembled, and by the authority of the same, That the inhabitants of the several towns within this Colony, may and they are hereby fully impowered at their annual town meetings, to determine and agree upon the utter destroying of the said bushes within their respective townships, and the time and manner how. And if any of the inhabitants of such town or towns so agreeing shall oppose the cutting down said bushes within their fields and enclosures, and forbid the other inhabitants coming thereinto for that end, they shall incur the penalty of twenty shillings, to be paid into the treasury of the town wherein they dwell. And if any such person shall thenceforward continue to oppose the cutting said bushes as aforesaid, they shall also incur the penalty of ten shillings per month until they shall declare to the Selectmen their free consent for their entering into such enclosures and destroying the said bushes therein growing. Said penalties to be recovered by distraint on the goods and chattels of the person or persons so offending.

Provided nevertheless, That if any person or persons have any of said bushes, the which they make use of or depend upon for a fence, such person or persons shall not incur either of the aforesaid penalties till after just satisfaction to them made by the town, as they and the selectmen can agree; or as by two or three indifferent men, chosen by said parties or appointed by the civil authority, shall judge reasonable.[2]

Several features in this law are worthy of particular note, for they shed interesting light on the thought of the times. The entire matter of barberry control, according to this law, was referred to the several towns with no concerted action in the colony as a whole, and, as one commentator has observed,[3] "the hands of the opponents of the bill are to be seen in the proviso, which threw upon the towns the necessity of first settling with farmers who might claim that the offending bushes were made use of or depended upon as fences, before they could enforce any of the penalties of the Act."

In 1779 this act was amended to read as follows:

An Act in Addition to and Alteration of the Law of this State entituled [*sic*] An Act concerning Barberry Bushes.

Be it enacted by the Governour, Council and Representatives, in General Court assembled, and by the authority of the same, That any person or persons whatsoever, with the advice and consent of the civil authority and selectmen, or the major part of them, of the town where any barberry bushes are or shall be growing, may in the months of March, April, October or November, enter into and upon any lands whereon shall be growing any barberry bushes and dig up and destroy such bushes without being liable to any action, suit or demand therefor; any law, usage or custom to the contrary notwithstanding.[4]

There does not appear to be any record of how many towns in the colony took advantage of the privilege granted in either the original law

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[2] Colonial Records of Connecticut, **7**: 10.

[3] Davis, A. F. Barberry bushes and wheat—a supplement to a chapter in "The old farmer and his almanack." Publ. Col. Soc. Mass. **11**:73. 1910. Trans. Jan. 1907.

[4] State Records of Connecticut **2** 176.

of 53 years' standing or of its amended form.[5] Timothy Dwight, however, who was President of Yale College, did record[6] that "In the year 1796, the town of New-Haven granted 200 dollars, for the purpose of destroying the barberry bushes, within its limits. Individuals are supposed to have expended at least as much more. They were principally destroyed, except upon Mount Pleasant. The method adopted to destroy them, was to eradicate them. The following year there was no blast; and from that time to the present both the wheat, and the rye, have been generally free from this evil."

Twenty-five years elapsed before further legislative action was taken in New England, this time by the General Court of Massachusetts. In 1754 a long and complicated law was passed, to remain in force for 9½ years.‡

According to one student* of New England history, all knowledge of this legislation and of the experience which led up to it would seem to have been forgotten for about thirty years after expiration of the temporary act. Commenting further on the law, he says:

> "It will be seen that five years and a half were given within which owners of the land were to extirpate all the barberry bushes in the Province, and that provision was made for procuring the work to be done in the case of common or undivided lands, as well as in cases of doubtful responsibility such as that of bushes growing in division walls. To secure the accomplishment of this work, reliance was placed upon the authority given to the general public to perform it in case of neglect by the owner. The Act was of a temporary nature. It expired by limitation in 1764. Much of the legislation of that day was temporary, and if there seemed to be occasion for renewal, the operation of such statutes was from time to time extended. This particular statute was not extended. Whether we may infer from this its success or its failure, is a matter purely for conjecture. In view, however, of the fact that modern botanists have established beyond doubt a connection between the barberry bush and the rust which infects wheat, it would seem probable that this wholesale attack upon the barberry bushes of Massachusetts probably had such a beneficial effect that when the time of expiration of the Act came round, it was not thought necessary to stimulate farmers by public legislation to protect their wheat fields in the future."

The third and last of the New England colonies to outlaw barberries was Rhode Island. In 1766 the legislature attempted to compel eradication in one section of the colony by passing a special law for the Town of Middletown, which "was so cumbersome in its machinery as to be doomed to failure."† It read:

> An Act for destroying barberry bushes in Middletown
>
> Whereas experience showeth, that barberry bushes have a very great tendency to blast English grain,

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[5] Bidwell, P. W. & Falconer, J. I. History of agriculture in the northern United States 1620-1860. Publ. 358. Carnegie Inst. Wash. 1925.

[6] Dwight, T. A statistical account of the city of New-Haven. A statistical account of the towns and parishes of the State of Connecticut **1**(1):64. 1811.

‡ The author of this article will be glad to send a copy of this law to anyone who is interested in its details. It appears in the Massachusetts Province Laws, 1754-55, Ch. 20. **3**: 797.

* Davis, *l. c.*

† Bidwell, *l. c.*

Be it therefore enacted by this General Assembly, and by the authority of the same it is enacted, That where any person in the town of Middletown, hath any barberry bushes growing in his or her field, or enclosure, and shall be applied to by any free holders in said town, to destroy them, and the person so applied to, shall refuse or neglect for the space of one month, to to [*sic*] cut up and destroy them, that then, and in such case, it shall, and may be, lawful for the person so applying, to make application to one of his Majesty's justices of the peace, who is hereby empowered to grant forth his warrant to impress labourers to cut and destroy all the barberry bushes there growing (for the destroying of which, applications hath been mde [*sic*] as aforesaid,) at the cost and charge of the complainant or complainants and not at the expense of the owner of the land, committing as little waste, and doing as little damage to the owner of the land as the case will admit of.

God save the King.[7]

Another commentator* says of this law that "If the title of this Act had been changed to 'An Act to protect barberry-bushes in Middletown,' it would have defined its apparent purpose about as well."

The inadequacy of this law must soon have become apparent, for six years after its passage, in 1772, the following was adopted:

AN ACT for destroying Barberry-Bushes
throughout this Colony.

Whereas it is found by Experience that Barberry-Bushes are very destructive to English Grain:

Be it therefore Enacted by this General Assembly, and, by the Authority thereof, It is Enacted, That if any Freeholder in this Colony shall apply to any Person having Barberry Bushes growing in his Field or Inclosure to destroy them, and the Owner of the Land shall neglect or refuse to cut them annually, or otherwise destroy them, he shall pay as a Fine, the Sum of Ten Pounds Lawful Money, One Half to and for the Use of the Town in which the Barberry Bushes grow, and the other Half to the Informer, to be recovered by Information before the Court of General-Sessions of the Peace, where the Land lies.

And it be further Enacted by the Authority aforesaid, That if any Barberry-Bushes shall be found in the Commons or Highways in any Town in the Colony, and any Freeholder of any Town therein, shall make Application to the Town-Treasurer of such Town to destroy them; and such Town-Treasurer shall refuse or neglect so to do, for the Space of One Year, That then, and in such Case, such Freeholder may make Application, to any One of His Majesty's Justices of the Peace for said Town, who is hereby empowered and required to grant his Warrant to procure Labourers to cut up and destroy the said Barberry-Bushes; the Expence whereof shall be paid out of the Town-Treasury of such Town.[8]

Thus ended the early American legislative attempts to control wheat rust by banishing barberries. Some success was recorded as having attended these efforts, but it seems safe to assume that without greater concerted action than was proposed in these laws, the depredations of rust were not markedly curtailed.

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[7] Rhode Island Colonial Records **6**: 509.

* Davis, *l. c.*

[8] Rhode Island Laws, August, 1772, p. 46.
Referred to in Rhode Island Col. Rec. **7**: 54.

20th Century Barberry Laws in the United States

There does not appear to have been any legislative action regarding barberry eradication in the United States between the colonial days of New England and the first quarter of the 20th century. During the intervening years barberry was gradually spreading westward, as a naturalized plant and through the agency of settlers. Eventually it became well established in the great wheat-growing areas of the upper Mississippi valley where its pernicious role in destruction of crops attracted growing attention as millions of dollars worth of grain was lost to the rust. During part of this period, the European investigations, already mentioned, were in progress, and when it became definitely known that barberry was an indispensable host in the life-cycle of the rust, the idea of barberry eradication as a control measure was no longer merely hypothetical. It had a scientific basis. That basis has since been strengthened by the incontrovertible evidence that barberry functions not only as the alternate host of the parasite but also as the place of origin of new physiologic strains of the rust which may be more virulent than previously existing forms and which may thus endanger hitherto resistant varieties of wheat.

Legislative action to remedy matters was not forthcoming, however, until 1918 when a basis was established for co-operation between the United States Department of Agriculture and 13 states which constituted what became known as the eradication area. These States were Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin and Wyoming. The United States Department of Agriculture established a quarantine, on and after May 1, 1919, prohibiting shipment of 31 specified species of barberry and 4 species of *Mahonia* from any state outside this area to any within it; it also became illegal to transport barberry plants from one state to another within the area.*

To give force to this campaign each state in the area passed its own eradication law, each one following the example set by North Dakota in 1917. Some of these statutes merely outlawed obnoxious plants in general, while others specifically mentioned the barberry and proposed measures for its eradication. Many of the laws, at least in their modified forms of today, include plants of the genus *Mahonia* under the ban and exclude those of the Japanese barberry, *Berberis Thunbergii,* which is so abundantly planted as an ornamental, for it has been found that *Mahonia,* the Oregon grape, which belongs to the Barberry family, may serve as an alternate host for wheat rust, whereas *B. Thunbergii* is not guilty of any such complicity.

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* Stakman, *l. c.*

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Pioneer Botanist

AMOS EATON. Ethel McAllister. 587 pages, illustrated and indexed. University of Pennsylvania Press, Philadelphia, 1941. $5.

McAllister's biography is significant for three reasons: *a*, because it is our first narrative history of the foremost educator-naturalist of the nineteenth century; *b*, for its historical sidelights on Eaton's botanical contemporaries, including some about which we have known heretofore very little; and *c*, for its genuine human interest—that is, a story worth the telling well told. Indeed, one wonders why his biography was not written many years ago, until the author points to the reluctance of the family to divulge facts pertaining to the "unfortunate period" of Eaton's life, 1812-15. That is, his four years of imprisonment at Greenwich, N. Y., for alleged intent to defraud. These years of "trial and affliction" carried with them, however, much of historic import, for William Torrey, State Prison Agent, and his son John Torrey came into Eaton's life. And John Torrey never went out of it. John Torrey was then a boy of seventeen but "a young scion of great promise." And it was then that young Torrey learned, as Eaton phrased it, "the name of Calyx, Corol, Stamen, and Pistil . " at Greenwich prison. His intercession probably later effected Eaton's liberation.

This second aspect of the book is perhaps fully as great a contribution to botanical history as the initial attempt to give a full, documented, and at the same time integrated, narrative of Amos Eaton's life. For where can we learn better of Torrey's personal views on his closest botanical interests, on his friends and colleagues—what he honestly thought of them and their work than through the medium of his letters to Eaton, here so liberally quoted? There are biographical fragments of Eddy, Barton, Lewis C. Beck, Jacob Bigelow, the Brogniarts, father and son, de Schweinitz, and Hosack. An instance of Eaton's far-reaching influence in the cultural growth of this country concerns his pupil, Mrs. Almira H. Lincoln, the author of *Familiar Lectures on Botany* (1829). More than 275,000 copies of this book were sold before 1872. Wrote Mrs. Lincoln, "The first lecturer on botany in the interior of North America was Professor Amos Eaton." (Catskill, N. Y., and Castleton, Vt., were points "in the interior.") There are interesting quotations and notes upon Rafinesque, whose writings Eaton followed sympathetically but not uncritically.

Fully documented, with glosses and explanatory notes, also a good index, this account of the "greatest popularizer of natural science that America has ever known" is at the same time a delightful volume for leisure reading. One reason is that the quoted letters and other primary, often heretofore unprinted, source materials are woven into the narrative with easy connecting paragraphs, a device too often slighted by biographers.

JOSEPH EWAN,
University of Colorado.

Field and Laboratory Observations Correlated by Dobzhansky

GENETICS AND THE ORIGIN OF SPECIES. Theodosius Dobzhansky. 466 pages, bibliography and index. Columbia University, Press, New York. Second edition, revised, 1941. $4.25.

Evolution as studied by the laboratory geneticist and evolution as seen by the field naturalist, ecologist and taxonomist seem to be two different subjects. The workers in either field are apt to assert that the work done in the other field has no real bearing on the problems of evolution. It is one of the outstanding merits of Dobzhansky's book that it attempts to close the gap between the experimental and the observational approach to the study of evolution. The author, who has a broad experience as field nat-

uralist and taxonomist, in addition to being one of the leading geneticists of our day, chooses from the rich array of genetic data those which have a direct bearing on the problems of the origin of species. Topics like mutation, chromosomal changes, polyploidy and genetic variability in natural populations are discussed in this light. After a firm basis of the genetic facts is established, an examination follows of the role of selection, of the factors which isolate species, and of hybridization phenomena (including sterility). The discussion is concluded by a treatment of evolutionary patterns and of the status and significance of species in nature.

The facts which are derived both from experiments and from an analysis of natural populations are presented in a lucid and straightforward manner, with speculation reduced to a minimum. The revised edition which became necessary after the first two printings of this popular book had become exhausted, is not only considerably enlarged (the size of the bibliography is about doubled), but several of the chapters are completely rewritten and a new one is added. Every botanist and zoologist who wants the latest information on the genetic interpretation of evolution and on speciation will turn to "Dobzhansky,' where he is sure to find what he is looking for.

ERNST MAYR,
American Museum of Natural History.

Manual for Microscopists

WORKING WITH THE MICROSCOPE. Julian D Corrington. 418 pages, illustrated and indexed. Whittlesey House, New York, 1941. $3 50.

An interesting and well organized manual of methods in microscopy, this book should prove particularly helpful to the serious amateur or the student in need of a treatment which is neither elementary nor highly technical for this fascinating subject. Included are detailed instructions for using the microscope and accessory equipment plus concise working directions for the preparation of a wide range of materials for microscopic examination. The many excellent photographs and line drawings will be especially useful to the person working without outside guidance. An interesting section is devoted to a discussion of newer techniques which have been devised within the past few years for the preparation of plant and animal tissues. The chapter on the preparation of reagents and the appendix which includes a list of sources of supplies, a bibliography, and a set of reference tables, contain much valuable information, in an up-to-date and readily available form.

VICTOR LARSEN,
Columbia University.

Equations in Soils

FACTORS OF SOIL FORMATION. Hans Jenny 281 pages, illustrated, indexed McGraw-Hill, New York, 1941. $3.50.

This book is an advanced treatise on theoretical soil science and covers just what the title indicates. The author is well equipped by ability, training, and experience to write this book. His method is unique. He writes the differential equation relating the total change in any soil property to the changes of the soil-forming factors and then studies the change in a soil property when one soil-forming factor varies and the others are held constant. The soil-forming factors which he considers as the independent variables are climate, organisms, topography, parent material, and time. Five of the eight chapters are devoted to the soil-forming factors considered separately, one-third of the book to climate. Not for the novice, this book is recommended to those who can read it.

F. W. KAVANAGH.

Communion With Nature

BY LIGHT OF SUN. Elsie Symington 196 pages, illustrated by Clare Leighton. G P Putnam's Sons, New York, 1941. $2.

In "By Light of Sun" Mrs. Symington gives an interesting tale of personal experience, from the time when, as a child, she visited at her grandfather's Maryland farm, loved it, and remembered the charm of plants growing in a sunny window. Through her life her various gardens are symbolic of her stages of unfoldment -a Georgian house with terraces and a walled garden, which she finds artificial; a sky-high apartment in New York, which makes her feel utterly separated from nature, the source of her

inspirations; finally, a farm, where she enjoys again the contact with soil, and the beauty of cultivated fields, the rhythm of the seasons and of day and night. Through intercourse with nature she has evolved a philosophy of life which has given her serenity of soul.

HENRIETTE MCC. WILLIAMS.

Book Notes

Beginners' Bouquets

FLOWER ARRANGEMENT MADE EASY. Dorothy Biddle & Dorothea Blom 40 pages, illustrated. Home Institute, New York, 1941. 15c.

For little more than a few cents' expense for this paper-covered book, the beginner can learn the fundamentals of flower arrangement as they are presented by two well known writers in this field.

For the Country's Future

CONSERVATION OF AMERICAN RESOURCES. Charles N. Elliot 472 pages, illustrated, indexed. Turner E. Smith & Co., Atlanta, Georgia, 1940. $1.80.

It will be long before too much will be written on conservation, so important is the subject to the American people; and the more popular style a book acquires, the more readily will it be given attention by readers who would avoid the heavier volumes. Dr. Elliot reaches out to those people to whom the subject is still new.

Naming the Trees at All Seasons

TABULAR KEYS FOR THE IDENTIFICATION OF THE WOODY PLANTS. Florence B. Robinson. 156 pages. The Garrard Press, Champaign, Ill., 1941 $2 50.

A guide for classification of trees, shrubs, and climbers in summer or winter on the basis of the distinguishing characteristics of each genus. In one genus, for example, veination, leaf edge, fall color, bark, color of veins and petioles, and leaf shape are each given attention; in another, fruit heads, leaves, sinus, seeds, leaf edge, base, bark, and petioles.

Nature Picture Books

SEEDS AND SEED TRAVELS, TREES, and BIRDS. Three booklets by Bertha Morris Parker. 36 pages each. Illustrated. Row, Peterson & Co., Evanston, Ill., 1941. 28c each.

Three excellent booklets by a member of the staff of the Laboratory Schools, University of Chicago; each one is effectively illustrated in color, and tells its story appealingly and well. Apparently written for young people, but of no small interest to adults.

Pros and Cons of Farming

OPPORTUNITIES IN FARMING. Paul W. Chapman. 48 pages, illustrated, indexed. Science Research Associates, Chicago, 1941.

A helpful career book which gives both sides of the question; one of a series designed to help young men find the place for which they are best suited.

Southwestern Flora Revised

DESERT WILD FLOWERS. Edmund C. Jaeger. 322 pages, illustrated, indexed. Stanford University Press, California. Revised edition, 1941. $3 50

A well illustrated guide to the plants of the Southwest and the California deserts. Both photographs and drawings are used, and a 16-page key precedes the text, which is given in the order of family relationship.

Ololiuqui

A CONTRIBUTION TO OUR KNOWLEDGE OF RIVEA CORYMBOSA. The Narcotic Ololiuqui of the Aztecs. Richard Evans Schultes. 45 pages, illustrated. Botanical Museum of Harvard University, Cambridge, Mass. 1941

A study which combines botany, ethnology, and pharmacognosy, and reaffirms the identity of a member of the Morning glory family as a narcotic plant that has long been known to the Aztecs.

Trees for Camouflage and Comfort

OUR SHADE TREES. Ephraim Porter Felt 316 pages illustrated, indexed. Orange Judd Publishing Company, New York. Revised edition, 1942. $2.

New material in this revised edition emphasizes the value of trees on the home grounds, speaks of their use in war-time camouflage, gives additional instructions for the care of trees, includes lightning and winter drying among the causes of injury, and devotes considerable space to newly developed diseases which are threatening the shade trees of America. An excellent book, especially for the property owner.

Current Literature At a Glance*

Montreal. An illustrated booklet describing the Montreal Botanical Garden and its services was received last month. Opening with an explanation of the Garden's services as an educational institute, an experimental and research station, a center for flower display, and as a beautiful park, the booklet contains descriptions of the flower gardens of annuals and perennials, the economic garden, children's garden, model community garden, trial garden, water and bog garden, the 21 greenhouses, nursery, and the two winter gardens. Descriptions are also given of planting features not yet completed, such as morphological, ecological, and taxonomic gardens. The booklet outlines the courses of study and other educational services offered, including training for children beginning with the age of four and opportunities for botany students at the University of Montreal; it also records the types of plant research carried on at the institution. Henry Teuscher, Director of Technical Services, was formerly Dendrologist at the New York Botanical Garden

Central and South American Scientists. An extensive list of institutions, societies and research workers in the pure and applied plant sciences in Central and South America has been prepared by the editors of *Chronica Botanica*, in co operation with the Division of Agriculture of the Office of the Co-ordinator of Inter-American Affairs, Washington, D. C. It has been published in *Chronica Botanica*, Vol. 7, Nos. 2 and 3 (March and May 1942).

The Corn Crop. Whether to space one's corn plants 9 or 12 inches apart in rows 30 or 36 inches distant from one another has been analyzed for three varieties of yellow sweet corn—SENECA GOLDEN, TENDERGOLD, and GOLDEN CROSS—by the New York Agricultural Experiment Station at Geneva. The bulletin, No. 700, describing the four-year experiment and giving the results may be obtained without cost from the station.

Three new sweet corn hybrids, called LEXINGTON, LINCOLN, and LEE, are announced in Circular 148 of the Connecticut Agricultural Experiment Station. They have been developed primarily for the market gardener who wants a rather large ear as early in the season as possible They mature the first half of August. Seed of these new varieties was available for planting for the first time this spring. The Connecticut station has also issued a list of two dozen varieties of sweet corn recommended for 1942. The season for each is mentioned, the names of firms which handle the seed, and planting recommendations are given. Extra copies of this list are available either from the station or from the New York Botanical Garden. A ten-page report of the trials which determined these recommendations has also been issued, but the supply of this is limited.

From Solar Energy. What is said to be the first successful experiment that approaches the action of photosynthesis in plants has been announced by Eugene Rabinowitch, who has been working at Massachusetts Institute of Technology for the Godfrey Lowell Cabot Solar Energy Research Fund, according to an article in *Time* March 23. The physicist has developed a cell in which chemical energy, formed by the conversion of light, is converted into electrical energy. "The light-transforming action of this cell can be roughly compared to the synthesis of food within green plants, a process which scientists have not been able to duplicate, even crudely," according to *Time*.

Redwoods. A new booklet has been issued in the interest of saving the imperiled redwood trees in northwestern California. Copies may be obtained from the Save-the-Redwoods League at the University of California, Berkeley.

Modern Gardens. The January issue of *Landscape Architecture* reprints Christopher Tunnard's "Modern Gardens for Modern Houses" which first appeared last September in the Bulletin of the Garden Club of America. Planning of the indoors and outdoors as parts of a single organism, showing the same spirit and the same technique in both, is recommended for the complete beauty of the homes of today and of the future.

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* All publications mentioned here—and many others—may be found in the Library of The Botanical Garden, in the Museum Building.

Notes, News, and Comment

Swarthmore. At the annual meeting of the American Association of Botanical Gardens and Arboretums at Swarthmore, Pa., May 23, Dr. H. A. Gleason, Mr. H. de la Montagne, and Mr. T. H. Everett were present as representatives of the Botanical Garden. The occasion was combined with the dedication of an outdoor auditorium for the Arthur Hoyt Scott Horticultural Foundation at Swarthmore College, for which Dr. C. Stuart Gager, Director of the Brooklyn Botanic Garden, gave the dedicatory address. The program also included the presenting of a special award to Mr. Richardson Wright for his work in the promotion of horticulture. Mr. Wright, who is the author of a number of books concerned with gardening, has been editor of *House and Garden* magazine since 1914. He is also chairman of the board of directors of the Horticultural Society of New York and of the International Flower Show. The honorary degree of Master of Arts was awarded to Mrs. Arthur Hoyt Scott during the program and the honorory degree of Doctor of Science to Mr. John C. Wister, Director of the Scott Foundation. Mrs. Scott, Mr. Wister, and Mr. Wright are all members of the Corporation of the New York Botanical Garden.

Board Meeting. Mr. Clarence Lewis was host to the Board of Managers of the Garden for the meeting of May 14 at Skylands, his estate at Sloatsburg, N. Y. After the business was finished, the Board members inspected the lilacs, tree peonies, rock garden, and other fine plantings maintained there.

Committee. Robert Moses, Park Commissioner of New York City, was named as a member of the Executive Committee of the Board of Managers of the New York Botanical Garden at the meeting of the Board last month.

Plant Distribution. Members of the Botanical Garden the last of April were offered one plant each of two choice begonias propagated at the Garden. One was the variety ***Glory of St. Albans,*** believed to be the most brilliantly colored of the Rex-cultorum begonias in cultivation. It originated as a chance seedling in the greenhouses of Sanders, well known orchid grower, at St. Albans, England. The Botanical Garden's stock was brought from England in 1938. This begonia has not previously been distributed in the United States. The second plant was a specimen of *Begonia Liebmanni,* an attractive rhizomatous species with white-flecked palmate leaves and bearing white flowers in April. The Garden's original stock was collected from the wild in Mexico by Mr. Thomas McDougall, and the plant was first exhibited in bloom at the International Flower Show in 1939. It was pictured and described in the Journal for December 1939. Members were also given a limited number of cuttings of other begonias and geraniums (*Pelargonium* varieties).

Board Members. Mr. William Felton Barrett was recently elected to the Board of Managers of the New York Botanical Garden in the class of 1943. Mr. Ellsworth B. Buck becomes an ex-officio member of the Board with his election as President of the Board of Education of New York City, succeeding Mr. James Marshall.

Torrey Club. Dr. W. H. Camp addressed the Torrey Botanical Club in the Member's Room at the Garden the afternoon of May 20 on "The Genetic Structure of Populations and the Delimitation of Species." At the evening meeting of the club May 5 at the American Museum of Natural History, Dr. H. Beaman Douglass, a member of the Corporation of the Botanical Garden and a frequent speaker at the Saturday lectures, gave an illustrated talk entitled "Botanizing in an Art Museum."

School Gardens. Dr. A. B. Stout represented the New York Botanical Garden as guest of honor at the 32nd annual luncheon of the School Gardens Association of New York City at the Hotel Pennsylvania May 9.

Conference. Reports from the laboratory of Dr. William J. Robbins constituted the monthly conference of the scientific staff and registered students of the Garden April 22. Frederick W. Kavanagh spoke on "Inter-relation between Thiamin and Four Types of Fungi" and Dr. Roberta Ma gave a demonstration of vitamins and their effect on the growth of several fungi.

Advisory Council. Mrs. Robert H. Montgomery was elected a member of the Advisory Council of the New York Botanical Garden by the Garden's Board of Managers May 14.

Honors. For outstanding service to New York City a testimonial was awarded to Major Gilmore D. Clarke last month by the Park Association of New York City. Major Clarke is now engaged on a development plan for the New York Botanical Garden. A posthumous Citation of Merit was awarded to the late Mrs. John A. Forster, also in recognition of outstanding service to the city, for her gift of nearly 10,000 orchid plants to the New York Botanical Garden in 1941. The awards were made at a luncheon at the Bankers Club May 20.

Judge. Mrs. Jerome W. Coombs recently returned from a trip during which she acted as judge at the Narcissus Show held by the Garden Clubs of Virginia in Washington, D. C. and, the following week, conducted a two-day course in flower arrangement and judging presented by the Oklahoma Association of Garden Clubs at the University of Oklahoma.

Visitors. Dr. Ray J. Davis, head of the Department of Botany at the southern branch of the University of Idaho, returned to Pocatello the middle of May after several weeks spent at the Garden examining the Rydberg type specimens for his work on the flora of Idaho.

Dr. A. J. Grout came to the Garden May 20 to work for several days in the Elizabeth Gertrude Britton Moss Herbarium.

R. C. Allen, Professor of Horticulture at Cornell, made a trip to the Garden during May to study the large collection of *Pelargonium* species and varieties, many of which are being displayed in Range 1.

Among other recent visitors were Clement G. Bowers of Maine, N. Y.; P. R. Deschere, Johns-Manville Corporation; Donald P. Limber, U.S.D.A. Bureau of Entomology and Plant Quarantine; and Walter H. Snell, Brown University.

Groups. Garden clubs, Boy and Girl Scouts, students, and others who have taken advantage of the effusion of flowers in spring to visit the Garden in groups include the following during recent weeks:

Parent-Teacher Association of Hawthorne High School, plant breeding and pomology class from Rutgers under Dr. J. H. Clark; botany class from Princeton under Dr. G. H. Shull; plant materials class from Columbia under Howard R. Sebold, Boy Scouts from Dongan Hills, Staten Island; Girl Scouts from Cranford, N. J.; Brownie Girl Scouts from Yonkers; Garden Department of the Leonia Woman's Club, Demarest Garden Club, Garden Circle of New Rochelle, and the Mamaroneck Garden Club, an Affiliate of the Botanical Garden, which engaged the Members' Room for a business meeting, after which the members had a conducted tour of the rock garden, perennial border plantings and the display houses in Range 1.

Laboratory. Miss Aviva Kogon has been engaged as an assistant in Dr. William J. Robbins' laboratory. She received part of her training as a graduate student in genetics and cytology under Dr. Alexandre Guilliermond at the University of Paris, and later under Dr. M. Simonet at Antibes, Alpes Maritimes, in southern France.

Gift of South African Flower Paintings

SOUTH AFRICAN wild flowers are shown in a collection of 27 paintings which have been presented to the New York Botanical Garden by Mr. and Mrs. William Fellowes Morgan of New York. They will be on display in the rotunda of the Museum Building during June, and will then be permanently placed in the Members' Room.

Painted in Cape Town by Miss E. M. Dicksey for Mrs. Morgan's sister, Mrs. J. Bryant Lindley, the pictures are remarkbly fine representations of their subjects. They are attractively and uniformly framed.

The plants shown are *Gladiolus cardinalis, G. blandus, G. inflatus, G. spathaceus,* and *G. grandis; Disa Herschelia, D. longicornu, D. racemosa,* and *D. grandiflora; Protea compacta, P. pityphylla,* and *P. melaleuca; Ornithogalum thyrsoides* and *O. aureum; Erica cerinthoides, E. viscaria, E. blenna,* and *E. ardens; Rochea coccinea, Pillansia Templemanni, Ixia viridiflora, Haemanthus coccineus, Nerine sarniensis, Anemone capensis, Gerbera Jamesoni, Harveya capensis, Agapanthus umbellatus,* and *Amaryllis Belladonna.*

Question Column

EVERY delivery of mail at the New York Botanical Garden and every hour at the telephone bring questions relating to botany which the Garden, as a public institution devoted to service, is always glad to try to answer. Each member of the staff is called upon to reply to those inquiries which bear most directly upon his field. The subjects are as varied as the temperature in spring.

Two questions of recent months and their answers are given below. The first is from a school child in the Bronx, who writes: "This term in school we are studying as our unit 'Inventors and Their Inventions.' My group is Luther Burbank. Through studying Burbank a serious problem has befallen us: Of what difference is the 'Burbank Potato' from any other potato? We would like to know if you can answer it for us."

The second question comes from a reader of this Journal who wants to know the difference between "botanic" and "botanical."

About Potatoes

The Irish potatoes are propagated or multiplied for field cultivation merely by dividing the tubers of a plant so that each piece has one or more "eyes," from which buds grow to make more plants. This means that all plants of the ***Burbank*** potato or of the ***Irish Cobbler*** potato, or of any other one kind, are really branches of only one plant. When one grows *seedlings* from seed taken from the ripe fruits of a potato plant, these seedlings grow up into plants that are extremely diverse, quite as brothers and sisters in the same family are different. Some of the potato seedlings produce small tubers and are worthless for cultivation; a few produce large tubers and have other good qualities and are useful for cultivation.

Mr. Luther Burbank, when he was a young man, saw some ripe fruits on potato plants. These fruits, I may say, are like small green fruits of the tomato plant, which is botanically related to potatoes. Mr. Burbank planted the seed, grew some seedlings and found that one was rather a good plant. Its tubers were cut up to make more plants and so on, down to the present time.

A. B. STOUT.

"Botanic" or "Botanical"?

Etymologically *botanic* is the primary form, from βοτανικός by way of *botanicus*. The -al is a later addition, which has been explained by the development of the word ending in -ic into a noun. So, it is said, when *cynic* became a noun, the need for an adjective led to *cynical*. *Botanic* was occasionally used as a noun in early days, and it is possible that *botanical* originated for that reason. However, the two words seem to be of equal age and interchangeable in sense from the beginning. We find "botanicall labors" and a "physicall garden" mentioned in 1640; Miller wrote in 1737 of his "botanik garden"; the famous garden in Chelsea was commonly known as the "Chelsea physick garden." In 1757 we find a "Botanic Reader," in 1797 "Botanical Dialogues."

In modern English *botanical* is almost universal in ordinary adjectival senses, meaning pertaining to botany or to plants. *Botanic* has survived only in the names of institutions, such as gardens, in which usage it seems to be preferred to *botanical*. Of all existing gardens in countries where English is the official language, about three-quarters are *botanic* gardens. *Botanical* gardens are found in parts of the United States, in Montreal, in Vancouver, and in other scattered places.

The Century Dictionary attempts to make a distinction in sense, defining *botanic* as pertaining to botany or the scientific study of plants, *botanical* as pertaining to the study of cultivation of plants. The distinction is not clearly made and does not appear in other dictionaries. It is true that such a difference of meaning has arisen in many such pairs of words, for example: *politic, political; economic, economical*. Such distinctions when well established should be carefully regarded, and even if merely incipient (as perhaps *comic, comical*) should receive consideration on their merits. *Electric* is replacing *electrical*, except in titles such as *electrical engineer*; this is just the reverse of the *botanic-botanical* process.

My recommendation would be that the word *botanic* be treated as obsolete and be retained only as a part of certain proper names, much as the word *Britannic* has survived in such a phrase as "His Britannic Majesty."

H. W. RICKETT.

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To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

THE CORPORATION OF THE NEW YORK BOTANICAL GARDEN

The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

The Advisory Council consists of 12 or more women who are elected by the Board. By custom, they are also elected to the Corporation Officers are: Mrs. Robert H. Fife, Chairman; Mrs Elon Huntington Hooker, First Vice-Chairman; Mrs. William A. Lockwood, Second Vice-chairman; Mrs. Nelson B Williams, Recording Secretary; Mrs. Townsend Scudder, Corresponding Secretary; and Mrs. F. Leonard Kellogg, Treasurer.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

VOLUNTEERS

ON the grounds and in greenhouses, laboratories, and library at the New York Botanical Garden, a small portion of the work often is performed by persons who are giving their time for the sake of learning while they labor.

In the horticultural department the volunteer workers range from boys of 12, a group of whom weeded and cleaned the borders and captured Japanese beetles last summer, to men and women of middle age and over who have requested this opportunity to learn the fundamentals of gardening in a place where they feel that correct gardening practices are performed. While some want this training because gardening is their hobby, others plan to become professional gardeners. A few volunteers who have given full time to the job and done their work well have eventually been placed in positions on the gardening staff. But this happens only exceptionally. To every volunteer, whether working every day from 8 to 5 or only a few hours every week, the Botanical Garden's aim is to give the opportunity for as broad an experience as possible

In the library, volunteer workers preparing for library training have from time to time compiled useful catalogs and reference files.

In the laboratories for plant pathology, plant breeding, and vitamin research, there is nearly always at least one volunteer, particularly during the summer Those who show promise in their work are sometimes rewarded with a scholarship of a month or two at the Garden But neither a scholarship nor a job is held out as a lure for persons who are willing to give their time free The chief requirement for a volunteer is that he or she have a serious purpose in desiring to work at the Garden. To such, a good opportunity for training and experience is offered. The Botanical Garden looks with favor on volunteers, being willing to contribute the time of staff members to teach them as they work, in exchange for the work they do, and considering this type of supervision part of the institution's responsibility for public education in the specialized realm of plant life.

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Domestication In A Decade

The Story of Guayule, America's Native Rubber-Producing Shrub, And How It Has Speedily Been Brought Into Cultivation From The Wild

By D. T. MacDougal

ONE of the most dramatic achievements in agriculture is the recent domestication of guayule (*Parthenium argentatum*), a rubber-bearing shrub native to an arid region in eastern Mexico and southern Texas. The conversion of a wild plant to a field crop is a serious task and one accomplished but rarely, as evinced by the fact that of the tens of thousands of plant species yielding substances useful to man, a comparatively small number have been adapted to cultivation. A few trees bearing nuts, oils, and fruits have been brought in from the forests within the last century, but the most important plant, pertinently enough, was the Brazilian rubber tree (*Hevea*), seeds of which were taken to the Far East in 1876, where plantations of a total area of about eight million acres were developed. This date may be taken as the beginning of the age of rubber. Today more inner tubes for automobile tires are in use than pairs of shoes worn by the populace. The prospective disarrangement of this ratio is the present cause of an economic flurry of the first magnitude.

*Speaking before a district meeting of the California Library Association in Monterey last April, Dr. MacDougal outlined the history of guayule development, presented here, with which he has been concerned for more than thirty years. Before he became Director of the Laboratory of Plant Physiology for the Carnegie Institution of Washington, Dr. MacDougal was Director of the Laboratory at the New York Botanical Garden. (This was between 1899 and 1905). He was also Assistant Director of the Garden for a year and a half. During the past few years he has lived in Carmel, Calif., but he retains his position on the Garden's Board of Managers which he has held ever since he was appointed one of the Scientific Directors in 1929. When this body was dissolved in 1933, he was made an Elective Manager on the Board.

Almost without exception domestication is preceded by a long period of utilization of products of wild plants. This has not been so with guayule.

The plant itself has been known to us only since 1852. Some information as to the gum produced by it soon became available with a resultant awakening interest. Actual recognition of the commercial value of the gum may be given as approximately that of the erection of a pebble mill for grinding dried plants at Torreon, Mexico, in 1903 by W. A. Lawrence, although earlier attempts at manufacture had been made. The Intercontinental Rubber Company joined in the activity by acquisition of a great tract of land which had once, in 1650, been taken from the primitive inhabitants by a Spanish family and in 1716 confirmed as a royal grant of 1,806,000 acres. It was then called the Hacienda San Juan Bautista de los Cedros, but now in the rubber and cattle days it is known simply as "Cedros."

The significant features of the development of the industry are included in the operations of this organization, especially since the possibilities of cultivation were considered in the acquisition of its vast land holdings. The value of scientific studies of the plant were recognized by the enlightened directorate, and Dr. F. E. Lloyd (now Emeritus Professor of Botany, McGill University), who was completing some special investigations on desert plants at the Desert Laboratory, Tucson, Arizona, was engaged in 1907 to make a comprehensive examination of the anatomy, growth, reproduction, and other features of this plant. The manuscript embodying his results was placed in my hands for publication in 1910 and appeared in Publication No. 139, Carnegie Institution of Washington, July 27, 1911.*

In consequence of personal relations thus established, a letter was received from Mr. Condit, manager of the project, early in 1910 asking that a botanist be nominated who might be induced to take up the task of bringing the wild shrub into cultivation, the importance of such a move being accentuated by the rapid depletion of the supply of native plants.

To this request I replied that no project of this kind had been carried through within my lifetime, that great difficulties might be encountered, but that Dr. W. B. McCallum, then engaged in some work with crops at the State Agricultural Experiment Station, Tucson, Arizona, had skill

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*Because of the current demand for information on guayule, the Carnegie Institution has recently re-issued this publication by the offset process, accompanying it with a later paper of Dr Lloyd's entitled "Mode of Occurrence of Caoutchouc in the Guayule, *Parthenium argentatum* Gray, and its Function," which first appeared in *Plant Physiology*, Vol. 7, pages 131-138, 1932. In this paper, Dr. Lloyd corrects an earlier statement about the occurrence of rubber, explaining that the milky fluid in guayule occurs in the parenchyma cells and is thus segregated, instead of flowing through the vascular tissue as in such latex-bearing plants as *Hevea, Euphorbia,* and others. Guayule shrubs are not tapped for their rubber, as are rubber trees, but the entire plant is ground up in a pebble mill, after which the rubber is separated from the fiber largely by a process of flotation.

and experience that well fitted him to deal with the many problems that undoubtedly would arise.

Dr. McCallum had hardly got germination, nursery, and field tests at Torreon under way when revolutionary conditions in Mexico made it advisable to remove all available seed and other material to Valley Center, California, in 1912, where some two million plants were grown in 1913 and 1914 in what is to be regarded as the actual beginning of the domestication of guayule.

It was soon seen that the species included many, perhaps thousands, of strains, differing in many characteristics. Some incidental experiments dealing with the genetics of the species were carried out by the aid of a small grant from the Carnegie Institution of Washington. The technical difficulties were so great that hybridizations were failures and entire dependence was placed upon selections for improvement.

Fifteen plants from the two million in the nursery were taken for a semi-final test as to growth, field stand, hardiness and rubber-producing capacity. All but two were eliminated. Successive sowings proved that the progeny of these two plants inherited their high rubber-producing capacity (17 percent) in limited field tests, and this was later increased to 22 percent.

The next step was to establish plantations on which commercial projects might be organized. A large ranch was acquired in southern Arizona, in the vicinity of the Desert Laboratory, with its guayule headquarters appropriately named Continental. Methods of cultivation, harvesting, etc., had been developed so that it could be said that a wild plant had been converted into a crop within a decade, an unprecedented accomplishment, made possible by the application of scientific methods in plant breeding, skill and aptitude in invention, and by an extraordinary board, the adventurous and sympathetic members of which were willing to accept this success as a great part of their compensation for expended millions.

It would be a mistake to think, however, that the above paragraphs include the rounded story of the acquisition of a new farm crop. The agriculturist who might have handed to him a few bushels of seed of maize with which he had no acquaintance, but which, he was told, was a plant of vital importance, would find himself confronted with a score of problems to be solved, concerning machinery and methods of tillage, harvesting, storage, and milling of the crop. For guayule, the last-named process was perfected chiefly by President G. H. Carnahan (from 1914 to his death in 1941), who came to his duties with the background of mining engineering. Also under his wise administration Messrs. J. M. Williams and D. O. Mulford designed mechanized machinery for nursery seeding, seedling diggers, toppers, transplanting machines of a capacity of two acres per hour, cultivators, diggers, harvesters, trucks, etc., an array of equipment necessary to make available slabs of black gum for the market.

The co-operation of the chemist up to this stage had consisted chiefly in making analyses of yields. Processing of the black gum for automobile equipment and other multitudinous uses comprises scores of problems for the chemist and it is in this field that the contributions of Dr. D. W. Spence, who was a member of the staff of the Continental Company for several years, were made.

The mills of the Continental Company are still grinding native shrub from the progressively depleted supply in Zacatecas and are taking steps for the establishment of plantations on its great Hacienda. The entire project at Salinas, California, with a network of 125 (reported) test stations has been taken over by the Federal Government. About 11 million young plants have been established in fields with a total area of 1,500 acres during the present season. A nursery of 700 acres has been seeded from which an area of 45,000 acres may be planted in 1943. All forecasts as to relief of rubber shortage should be checked by these estimates. Twenty-five hundred tons of guayule rubber from Mexico and an equal amount from the United States may be expected in 1943. An optimistic estimate for 1944 would be no more than 10,000 tons, which, added to political versions of chemists' dreams of "artificial" rubber, would comprise about half of the amounts needed to maintain the present standard of mechanization.

The ultimate value of the brilliant accomplishments by plant scientists in the domestication of a wild plant within a decade may be discounted and shadowed by disappointments raised by unreliable estimates.

Outside of the great famines the civilized world has never faced a deficit of material so basic to its economy (even comprising hunger in its effects) as the prospective rubber shortages in the next five years.

What Is Guayule?

By Carol H. Woodward and D. T. MacDougal

NATIVE to the desert regions and dry mountain slopes in north-central Mexico and adjacent Texas, guayule is a scrubby-looking, knee-high shrub with silvery leaves and inconspicuous whitish heads of flowers which indicate that it belongs in the Composite family. Its botanical name of *Parthenium argentatum* suggests a relationship with the feverfew of gardens (*Chrysanthemum Parthenium*), which was once in the genus *Parthenium*.

Guayule will be found where yuccas and cacti and century-plants are

also seen growing wild. While the Mexicans used it to make the balls for their ancient game of pelota, guayule was not employed by white men until 1903, when the first attempt was made to manufacture rubber from it. During the next few years the new industry held great promise, but the decline in the supply, where wild plants were being used, coupled with the competition of rubber from East India, made it impractical to continue on the scale anticipated. Guayule was all but forgotten by the outside world for nearly fifteen years. Then, around 1925, interest was revived when it was realized that plantations had been established in California. Meanwhile mechanized agricultural machinery and improved processes of manufacture were being developed. In 1931 the harvesting of what was called the state's first rubber crop was reported in a popular magazine. In 1932 Dr. Lloyd's second scientific paper appeared. The first had come out at the height of the earlier interest in guayule rubber in 1911, resulting from research he had begun four years earlier.

Now, suddenly, research and production are both being speeded up to such an extent that rubber from guayule, it is predicted, will begin to replace our vanished supply of rubber from *Hevea brasiliensis* by 1945.

How Guayule Is Grown

In the cultivation of guayule it has been found most profitable to germinate and sow the seeds in nurseries. The seedlings are transplanted, about 7,200 to the acre, when less than a year old. Rubber is found in very young plants, but it has been found most profitable to defer harvesting the crop until it is three or four years old, although the amount in any one plant increases still further but at a lower rate for several years more. The heavy root system is rich in rubber and the entire plant is taken up; propagation by cuttings has not yet been made either practical or successful, although experiments with this method now in progress at one of the Japanese relocation centers is well justified.

The project of the Intercontinental Rubber Co. at Salinas, Calif., was transferred to Federal control early in 1942. The accumulated store of high-grade seed was germinated immediately and the seedlings now occupy a nursery of 700 acres, with the expectation that something like four million may be transplanted before next season to occupy 40,000 or 50,000 acres.

The stand of wild plants in Mexico and Texas includes a great medley of strains, some of which are low in rubber but some yield as high as 15 or 16 percent of their dry weight.

Domestication of this plant has been accomplished entirely by selection among individual plants with high yields. Hybridization experiments have as yet not been successful. Hybrids may yet be produced which might

offer improvements over the selected strains, but it is not likely that the percentage of rubber could be increased much over the 22 percent of some three or four established strains. The student of plant breeding will find some interesting comparisons in the development of the sugar beet, to meet the needs of France arising from blockades and embargoes on cane sugar during the Napoleonic wars. Progress was uncertain until the principles of selection for improvement were established by Vilmorin about the middle of the last century.*

While guayule may yet become an important crop on the Pacific Coast and in the semi-arid Southwest, no increase in the amount of rubber produced before 1945 may be expected. Additional plantings may be made only as high grade seed is secured. It is to be recalled that five to ten million pounds of rubber have been secured annually from wild shrub in Mexico since 1906. It will be several years before an equal amount is produced by domesticated plants.

Booklet on Succulent Plants Issued, Based on Alexander's Articles In Botanical Garden Journal

THE articles on cacti and other types of succulent plants which have been appearing at intervals in this Journal since February 1941, under the authorship of E. J. Alexander, have been made into a paper bound booklet of 64 pages, which the Garden is offering for sale at 50 cents a copy. "Succulent Plants of New and Old World Deserts" is the title. In addition to the material which was printed in the Journal for February, July, and November, 1941, and April and May, 1942, the booklet contains a supplementary list of some little known New World succulents, an article also by Mr. Alexander on the culture of succulent plants (reprinted here), and an additional full-page illustration, showing one of the Garden's showiest succulent plants in the Main Conservatories—*Aloe Thraskii* from South Africa, which blooms abundantly every winter. The index to species and illustrations, which concludes the booklet, shows that nearly 350 species have been treated, and of these, more than 100 have been illustrated.

The original articles which have been reprinted from the Journal are, besides the introduction on Succulent Plants at the Botanical Garden, "Desert Cacti of the Americas," "Succulent Plants of the American Deserts," "Stone-Mimicry and Windowed Plants," and "Succulent Plants of the Old World."

*DeVries. Species and varieties: their origin by mutation. Edited by D. T. MacDougal. P. 92. 2nd edition, 1906.

Culture Of Succulent Plants

By E. J. Alexander

(Reprinted from pages 61 and 62 of "Succulent Plants of New and Old World Deserts" issued by the Garden in June 1942)

The type of soil in which a desert succulent will grow best.

SINCE the desired objective in growing plants is not just to keep them alive, but to keep them in good health and with regular flowering periods, it is well to know something of their culture. One of the first steps along this road is an understanding of the soil and climate of their native homes. The types of succulents with which we are here concerned are natives of arid and semi-arid regions. The rainfall in such regions

is slight, and for that reason the natural mineral foods are not dissolved from the soil and washed away. This tells us that cacti and other succulents are accustomed to rich and plentiful food, and must not be expected to thrive on a starvation diet. Not only decayed vegetable matter, but lime also is a natural element in most desert soils, and both must be supplied if the plant is to remain in good health and growing condition. The other essential is water, with good drainage. Succulents need more water and food during their growing season than is generally believed, *provided* the drainage is perfect.

The soil mixture, then, is the first thing to consider. The following has been found to be the best general soil for the great majority of succulent plants: 1/3 good loam, 1/3 coarse sand (*not from the seashore*), 1/3 well decayed leafmold or humus. To this should be added about 10 percent powdered charcoal and lime (either hydrated lime or old mortar if obtainable). There should be placed in the bottom of the pot or box at least an inch of coarse sand or gravel—this insures good drainage. The above mixture may vary in different sections of the country, depending upon the sandiness of the loam or the amount of humus present. For most succulents the soil should be neutral or slightly alkaline; in some cases strongly alkaline. It is always well to remember that the chemical composition of the ash of these plants is about ¾ calcium compounds, and that this element must be supplied in order that the plant may build up its tissues properly; otherwise weak growth is the result, as well as few or no flowers. Liquid manure is beneficial for healthy, colorful growth and flower production; there are also special cactus foods on the market.

The next thing to consider is the container. Usually earthenware pots are used. Unless the pots are quite large, they should be placed within a glazed jar, or better still, within a somewhat larger pot, the space between being filled with sand. The best method of all, if one has the facilities, is to plunge the pot to within an inch of the top in a large container of sand or loose soil. Glazed or painted pottery is also recommended as it will prevent the soil from drying out too rapidly. Drainage is best at the sides near the bottom, but the ordinary type of hole in the bottom is just as satisfactory, although the roots may grow through it. If there is no drainage, then extreme caution must be used in the watering. Now, as to the reason for all this caution about too thorough drying out of soil and container. It is for protection of the tender feeder roots. In arid regions there is always a water-level somewhere under the surface, and when unconfined, the roots travel great distances until they find it. When confined inside containers, the roots quickly seek out the best source of moisture, and this is the walls of the container. Consequently, if these are hot and dry, the tender hair-like roots which absorb moisture, and with it food, will be burned or dried out, and the plant will then suffer

from slow starvation. Miniature pots should not be used as they do not hold enough soil, and they also dry out too rapidly Always use a container slightly larger than the diameter of the plant.

Next is watering. During the growing season either a small amount of water may be given every day, or the soil may be wet through and not watered again until nearly dry. During the dormant period, water once a month is sufficient—or once every two weeks if the containers are small or the temperature constantly above 60 degrees. The period of dormancy varies for the different kinds of succulent plants. For most cacti it is from October to March, for most South African succulents it is May to September. For many from both Old and New Worlds it is variable, even for species in the same genus. The best method of telling is to watch the plant, water when it shows growth, and give less water or none at all for a while if it shows no sign of growth. It is safer to keep a plant slightly on the dry side rather than too wet. When in doubt, do not water.

The final thing to consider is light. Most of the smaller cacti and many other succulents do not, as is generally thought, grow in full desert sun, but in the light shade of bushes. While some sunlight is necessary, the hot afternoon summer sun is really harmful. It frequently burns the plants and makes them unsightly. Some screening is helpful, such as lath shading, venetian blinds or muslin. There are some succulents, particularly the species of *Haworthia, Gasteria* and *Rebutia,* which grow better if always kept in light shade.

Do not use insecticides on succulent plants. If any insect pests appear, they should be removed with a soft tooth brush and running water.

In purchasing plants, the most satisfactory results are obtained from specimens bought from dealers who raise their stock from seed. These plants are always healthier and cleaner, and have a much greater chance to live than plants dug from the wild, as their root-systems are undamaged. Or, if you prefer, you may easily raise your own plants from seed, which is obtainable from several dealers.

These general directions do not necessarily apply in large greenhouses where conditions of temperature, moisture and light can be controlled. They are principally meant for home or apartment conditions where one has to make the most of such space as is available. Growers in large establishments have various methods worked out for the solution of their particular problems. There are, of course, certain difficult sorts which can only be grown under glass. If the reader will be content at first with the types that he can grow successfully and readily, it will be found that little by little, enough experience may be gained to try the more difficult kinds. It is then that the real thrill of growing succulents begins.

South America's Contribution In Medicinal Herbs

A Brief Description of Coca, Cinchona, Sarsaparilla, Ipecac, Cocillana, and Barbasco As Presented April 8 at the Conference on Herbs and Drug Plants at the New York Botanical Garden

By Henry K. Svenson
Curator of the Herbarium
Brooklyn Botanic Garden

WE often forget, or fail to realize, the great contribution that South America has made in food, medicine, and pure science. This is especially true of the region now included in the republics of Ecuador and Peru where the Incas and their predecessors, in a semi-arid climate perhaps similar to that of their original home in eastern Asia, developed such important foods as the potato and Indian corn. From this Inca region extending from Chile to Quito have likewise come some very important drugs. Long before the English settlers had begun colonizing the United States, Pizarro had in 1527 landed on the dreary desert coast of Peru at Tumbez, very close to the present Ecuadorean boundary, but was forced by opposition of the natives to return to Panama. On a second expedition, in 1531, he again reached Tumbez, made his way up into the Andes, and soon had the Inca kingdom under the rule of Spain. How Pizarro managed to make his way so quickly through the desert region of northwestern Peru has been a puzzle; it has been suggested that he may possibly have encountered a rainy period, such as occurs every ten years or so, in an area which the Encyclopedia Britannica characterizes as "nearly as destitute of vegetation as the African Sahara." Such a rainy season occurred in the desert area of Western Peru in 1941, and its effects extended as far southward as Lima. When Pizarro made his way into the heart of the Inca region he found the coca plant was already under long cultivation on the warm and moist eastern slopes of the Andes.

Erythroxylon Coca (a member of the Erythroxylaceae, a small family containing about 90 species of the New and Old World tropics) is the species of commercial importance. The dried leaves of this plant (the source of cocaine) carried in the mouth and mixed with a small quantity of lime, much in the manner of the oriental betel-nut, produce a sort of anesthesia of the stomach whereby the Peruvian Indians are enabled to go long distances without food or drink. This is by far the earliest drug plant of South America to be known in Europe, its fame reaching the Old World soon after the Spanish conquests. Nicholas Monardes, a physician in Seville, probably deriving his information about coca from Piedro Cieza de Leon, who came to the New World at the time of the Conquest, described the coca plant as early as 1569. In his edition of

1574 (translated by Frampton in 1577), Vol. 2, p. 31, he says:* "I was desirous to see that herb so celebrated of the Indians, so many years past, which they do call the Coca, which they do sow and till with much care and diligence. . . . They carry them [the dried leaves] from some high mountains, to others, as merchandise to be sold and they barter and change them for mantles and cattle and salt. . . . The use of it amongst the Indians is a thing general, for many things, for when they do travel by the way, for need and for their content when they are in their houses, they use it in this form. They take cockles or oysters, in their shells, and they do burn them and grind them, and after they are burned they remain like lime, very small ground, and they take of the leaves of the Coca, and they chew them in their mouths, and as they go chewing, they go mingling with it of that powder made of the shells in such sort, that they make it like to a paste, taking less of the powder than of the herb, and of this paste they make certain small balls round, and they put them to dry, and when they will use of them, they take a little ball in their mouth and they chew him: passing him from one part to another . . . and so they go, using it all the time that they have need, which is when they travel by the way, and especially if it be by ways where is no meat, or lack of water. . . . When they will make themselves drunk and be out of judgment, they mingle with the Coca the leaves of the Tabaco, and they do chew them all together, and they go as they were out of their wits, like as if they were drunk which is a thing that doth give them great contentment to be in that sort."

It was not until 1884 that the value of cocaine as a local anesthetic was recognized, but its discovery as such was not an accidental one as generally supposed, but the result of long-sustained research by Koller (see Mortimer, W. G., Peru, History of Coca, "The Divine Plant of the Incas," 1905, p. 413).

In chronological order the second important drug plant of South America is sarsaparilla, which was introduced into Europe about 1550, being obtained from the vicinity of Guayaquil in Ecuador. To quote from Monardes (Frampton translation, Vol. 1, p. 38): "The Sarcaparillia is a thing come to our parts (Europe) after the China [root]. It may be twenty years that the use thereof came to this City. It first came from the new Spain, and the Indians did use it for a great Medicine, with which they did heal many and divers diseases. . . The Spaniards did call it Sarcaparillia when they saw it. For the great likeness that it hath with the Sarcaparillia of these parts [Spain]." And in the second part of the same volume (p. 163): "In the first part we said, how that they brought Sarcaparilla from Peru . . [and later from Honduras]. . . . And now they bring it not only from the Peru, but also from the Province

* Modern spelling is being used for these quotations, but the original capitalization has been kept.

Myroxylon peruiferum, the true balsam of Peru.

From A. W. Haggis, "Fundamental Errors in the Early History of Cinchona." Used through the courtesy of the *Bulletin of the History of Medicine,* where it appeared in October 1941, Vol. X, No. 3.

of Quito, and from all that coast: and the best and that which doeth greatest effects, is that which they bring from Guayaquil. . . This Sarcaparilla, doth grow at the side of a River which cometh from the mountains of the Peru which is near to a place that is called Chimbo. . In the plain countries, it passed by a place that is called Saint James of Guayaquil . . in the banks of this River there groweth great quantity of Sarcaparilla. . This River which is called Guayaquil hath great virtues . . . with the water of it they do heal great diseases, and for this cause the people come more than six hundred leagues to heal themselves with it. . . . Others there be which heal by taking of the Sarcaparilla, which groweth there, and it is understood that the virtue which it hath is taken of the water, of the River." To the present writer it appears that much of this magic might be attributed to the crystal-clear tributaries of the Chimba, which today provide the water-supply of the city of Guayaquil. The curative properties of sarsaparilla rested primarily on the ability to produce excessive perspiration.

The meaning of the word sarsaparilla is still not clear, but is apparently associated with the name of *Smilax aspera* which grows in southwestern Europe. Several different species of *Smilax* contribute the drug, which is obtained from the bark of the roots, the best-known coming from the Chimba region. Other kinds of *Smilax* producing sarsaparilla are known from the coastal region of Peru and Ecuador, and also from northern Ecuador. Sarsaparilla was used in Europe as a substitute for the "china-root," an oriental species of *Smilax*, and the name CHINA-CHINA, applied to the sarsaparilla, has brought confusion not only to the South American plant, but also to the history of quinine and to the *Smilax* species of the eastern United States.

We come now to cinchona, the most important drug of South America. It was first known from the vicinity of Loja in Ecuador and has had a colorful history. It is supposed to have been introduced into Europe by the Countess of Chinchon, for whom it was named *Cinchona officinalis* by Linnaeus. Early accounts such as its use by mountain lions for a kind of intermittent fever, and of pools made intolerably bitter by fallen cinchona branches merely emphasized that Indians used the bark for malarial fevers. As A. W. Haggis has shown in his extensive article, "Fundamental Errors in the Early History of Cinchona," published in the Bulletin of the History of Medicine in October of last year, the story of its introduction into Europe by the Countess of Chinchon is entirely a fable. Cinchona was introduced into Europe, probably by the Jesuits, about 1630 to 1640. The origin of the legend of the Countess of Chinchon and her introduction of cinchona is not known, but was derived from some of the Italian botanists of the period. The diary of the Count of Chinchon, who was the Spanish viceroy at Lima, has been recently found and he makes no mention of fevers or the use of cinchona.

There were, as a matter of fact, two Countesses of Chinchon—the first died in Europe before the Count sailed for Peru; the second lived for some time in Lima, but passed away in Cartagena in Colombia on her return voyage to Spain. Haggis points out that the bark of the Ecuadorian "fever tree" (cinchona) had for a long time been surreptitiously mixed with the more expensive bark of the Peruvian balsam (*Myroxylon peruiferum*), which was called QUINA-QUINA. It was not until later that the superiority of the Ecuadorian bark came to be known. Meanwhile, since cinchona had been used as an adulterant for the bark of the Peruvian tree, the name of "Peruvian bark," which had been wrongly applied, remained after cinchona came into independent use as a medicine. A number of *Cinchona* species producing commercial bark are now known inhabiting cool situations in the Andes from Colombia to Peru, but as in the case of rubber, transplantations in the East Indies where selected strains, especially of *Cinchona Ledgeriana,* have been successfully grown have furnished most of the commercial product. Very satisfactory quinine is now being produced, however, by the Danish pharmacist, Dr. Pedro Holst of Guayaquil, from native bark.

Ipecac is another of the South American drug plants which has had many substitutes. The true ipecac came from the Diamantina region of Brazil, and though it was known in Europe previous to 1672, its botanical source, *Psychotria Ipecacuanha,* was not known until 1800. One of the recent and most important substitutes for ipecac is cocillana (*Guarea Rusbyi*) which comes from Bolivia and Peru. This important tree was discovered by Professor Rusby in 1896 and named by Dr. Britton of the New York Botanical Garden.

A still more recently discovered South American product which may be classed as pharmaceutical is barbasco. It is an insecticide, however, not a medicine. One of the materials used by the natives as a fish poison, it is rapidly gaining importance in its adopted use for the protection of North American crop plants. Though injurious to insects, these insecticides are harmless to human beings. Barbasco is derived from several related plants growing in the Amazon watershed and along the west coast of Ecuador. The evergreen tree *Jacquinia pubescens* is one important source for this valuable South American drug.

Address To Graduates Of The Two-Year Courses

Presented at the New York Botanical Garden by Walter D. Blair

YOU are now familiar with the trees, shrubs and plants whose forms, foliage and flowers constitute the raw materials of gardening. Their arrangement and combination in space constitute the art of gardening. I emphasize two words "in space," for if you are to make the best use of your knowledge, you must be aware of and make visible the emotional properties of space.

What are some of these properties? A feeling of elation and freedom that comes from far boundaries; an incentive to action that comes from receding distances, as when one looks at ridge behind ridge of distant mountains; a feeling of power as one moves through space; a feeling of rightness when harmony exists between an object and its surrounding space; a cathedral and its square; the size of a room and its use. *You must feel space as a visible, tangible medium, having breadth, depth and form.* You will, with your plants, make subdivisions, boundaries and enclosures of space.

In it your garden will exist; into it you will project your patterns and groupings of floral masses, of colors, and of varieties of plants. The spatial relationships between the parts of the garden constitute a beauty in addition to the beauty of any particular flower or part.

When there is but one object, it exists by itself yet is still related by empty surrounding spaces to some enclosing boundary. But if there be two objects, immediately something that was not there before appears—the relationship between the two objects, far or near; contrast, identity or harmony of shapes and sizes. Esthetic judgment decides whether they are too far or too near, whether pleasing or displeasing. It is for you to imagine the relationship and modify it till it satisfies you. If the objects be more than two, many spatial relationships arise. Spatial patterns appear and the eye, following them, transmits to feeling the delight of design in arranged and related colors, forms and masses, in sinuous and flowing movements, in repetition and emphasis. These patterns penetrate space and have the beauty of abstract design.

And here it may be asked: What is beauty? My definition is that *beauty is any relationship in time, sound, form, space, color, conduct that rouses the emotions and leaves a feeling of pleasure.* Relationships of time and sound constitute music; relationships of form constitute sculpture; relationships of form and space constitute architecture; relationships of color constitute painting; relationships of conduct constitute ethics. And what of gardening? Relationships of plants and space constitute gardening. So I urge upon you this awareness of

(*Continued on page* 182)

Program for Students June 25

TEN students who had completed their work in the Two-Year Science Course for Professional Gardeners and the Two-Year Course in Practical Gardening received their certificates at graduating exercises held the evening of June 25 in the lecture hall in the Museum Building. The principal address was given by Mr. Walter D. Blair of Tarrytown, architect, and President of the American Rock Garden Society. Refreshments were served at the close of the program, which was attended by about 150 persons.

Science Course graduates were Theodore Olack, student gardener; William B. Ash, temporary gardener; Archibald Colquhoun, former student gardener, now with the U. S. Army; and Eugene Brady, Thomas Dwyer, Thomas Hennessey, and Meyer Kaplan. Graduates in the Practical Course were Mrs. Mildred Duff, Louis Abrams, and John Polchinski.

Mr. Blair exhorted the graduating students to "go forth into the quietude of nature, aware of her fecund forces and her varied forms of life These forces and forms," he said "will become your intimate companions and you will love them and know how to guide them into channels useful for man."

The major part of Mr. Blair's address is reprinted here.

ATTENDING THE TORREY BOTANICAL CLUB'S 75TH ANNIVERSARY CELEBRATION AT THE NEW YORK BOTANICAL GARDEN

JUNE 23, 1942

Torrey Club Celebrates 75th Anniversary

Commemorative Program Given At Botanical Garden

THE Torrey Botanical Club, which was one of the agencies chiefly responsible for the organization of the New York Botanical Garden, celebrated its 75th anniversary the week of June 22 in New York. The second day its members met at the Botanical Garden, where they were joined by members of the Garden itself and of the Botanical Society of America, meeting in New York at the same time. About 140 persons attended the morning program, the luncheon, and the afternoon tour of the laboratories, herbarium, conservatories, and grounds of the Garden.

Dr. William J. Robbins inaugurated the day's events by speaking on "The History of the New York Botanical Garden."* Other addresses given included "Contribution of the Torrey Botanical Club to the Development of Taxonomy" by Dr. H. A. Gleason, in which the early work of Bicknell, Britton, Brown, Hollick, and Rusby was particularly cited; "Modern Taxonomy and Its Relation to Ceography" by Dr. H. K. Svenson, of the Brooklyn Botanic Garden; "Economic Aspects of Taxonomy" by Dr. E. D. Merrill, Harvard University; and "The Importance of Taxonomic Studies of the Fungi" by Dr. F. D. Kern of Pennsylvania State College.

Other events of the week included a program at Columbia University on the opening day, with a tea and exhibit of Torreyana in the afternoon and the anniversary banquet in the evening; a program at the Boyce Thompson Institute for Plant Research in Yonkers on Wednesday, followed in the evening by an address by Dr. Robbins at the American Museum of Natural History, entitled "Plants Need Vitamins, Too"; a program at the Brooklyn Botanic Garden Thursday; and a field trip to the Pine Barrens and adjacent regions in southern New Jersey on Friday and Saturday.

Much of the material for the exhibit at Columbia was provided by the Botanical Garden's library and herbarium.

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*This address will be printed in a forthcoming number of the Journal. Others, it is planned, will be published in *Torreya*.

In the Picture

1 H. K. Svenson, 2 Robert Hagelstein, 3 C. Stuart Gager, 4 John A. Small, 5 Harold C. Bold, 6 Clyde Chandler, 7 William J Robbins.

10 John S Karling, 11 A. E. Hitchcock, 12 Mrs. Jerome W. Coombs, 13 Prof. Marie-Victorin, 14 Mrs. Robert H. Fife, 15 F. D. Kern, 16 E. D Merrill, 18 H A. Gleason, 19 Ernest Ball, 20 Virgene Kavanagh, 21 James Marvin, 22 Arthur Hillegas, 23 F. W. Kavanagh.

24 C F. Mook, 25 W. A Dayton, 26 Charles E. Allen, 27 A. B Stout, 28 H. H. Clum, 29 Hettie Chute, 30 Robert Bloch, 31 F. W. Pennell, 32 Walter P Green, 33 Mrs Ernest Ball, 34 Mrs. A J Eames, 35 Anna F. Jenkins, 36 John Dodd.

38 Ethel Welty, 39 G. S. Torrey, 40 Mrs Mary I. Turner, 41 Lloyd Weaver, 42 George H. Shull, 45 F L Howard, 46 R. H. Wetmore.

50 Clara S Hires, 52 Dorothy Meier, 53 Jean Stewart, 54 J. H Barnhart, 55 Gussie F. Miller, 56 Margaret Fulford, 57 E P. Killip, 58 F. Lyle Wynd, 59 Ann F. Bowler, 60 A. J. Eames, 61 Harriet Creighton, 62 Grace Antikajian, 63 Esther Zimmer, 64 F. J. Seaver, 65 Mrs F. J. Seaver, 66 Mrs. Helen Upson.

67 D Elizabeth Marcy, 68 Carol Anderson, 70 Lazella Schwarten, 71 Mrs R R. Stewart, 72 Alfred Gunderson, 73 Aviva Kogon, 76 Gordon Whaley, 77 E W Sinnott, 78 Annette Hervey, 79 Anita Appel, 80 Vivian Trombetta Walker, 81 M. A. Chrysler.

84 Sarah H. Harlow, 85 Mrs. A G. Vestal, 86 Jennie L. Simpson.

87 Erling Dorf, 88 Norma Pfeiffer, 90 A. G. Vestal, 91 Dorothy Hammond, 92 G. L Wittrock, 94 R. R. Stewart, 95 B O. Dodge, 96 Peter Johnston, 97 Mrs B. O. Dodge, 99 A. F. Blakeslee, 100 Mrs. E. D. Merrill, 101 Cornelia Carey, 104 Roberta Ma, 105 Stanley A. Cain, 106 Ruth Patrick, 107 J. P. Carabia, 109 Roland Walker, 110 John H. Pierce, 111 W. H Camp, 112 E. B. Matzke, 113 Frank Lehr.

Among others who attended the program of the day but who have not yet been found or with certainty identified in the picture are Mrs William J. Robbins, Rosalie Weikert, Mrs H K. Svenson, Mrs. A. F. Blakeslee, Mrs. Irving McKesson, Mrs. T L. Clarendon, Elizabeth C. Hall, Mary Bartley Schmidt, Anna Jane Phillips, Marie Siegele, Lilly Fasse, F. X. Stevens, Jr., Ernest Abbe, A. O. Dahl, Oliver P. Medsger, P. W. Zimmerman, H. W. Rickett, Charles L. Gilly, Elva Lawton, Nettie M Sadler, Myrtle A. Hinman, Alma Ericson, Mrs. Elliott Averett, M. A. Raines, and Henry Hicks. This is by no means a complete list, and the Garden would be glad to have identifications for those that have been missed in the accompanying photograph, as well as the full names of others who were present.

(*Continued from page* 179)

space. Arrange your flowers so that they have pleasing masses which are related in space by patterns that also please. It is a delight to evolve beauty by the simple device of position, and beauty of shape can often be attained by the addition or subtraction of a few plants.

Vistas are penetrations of space. Geometric forms are precisions, fixations of space. The first arouses the emotions of freedom and aspiration; the second the emotions of security and shelter. Man longs to be both free and safe. With vistas the garden designer says, "Dream and aspire!" with geometric forms he says, "You are safe here!" Both desires are part of normal life and their fulfilment is necessary to a complete life.

A conqueror is preoccupied with projecting himself into time. A gardener projects his patterns into both time and space, combines foliage and flowering masses into related forms that excite interest and delight. He sees his ideas, not himself, projected into time. Sensitive to ratio and space, he imbues his designs with movement and harmonious proportions and considers future growth as his helper in achieving his ends.

In laying out a garden, its form is more important than the materials that make its form. Its design should be the dominant idea, its flowers but its embellishment. The design is permanent, making its appeal before, during and after the flowering of the plants. The flowers pass but the design remains. Here again we come in contact with proportion, the relation of parts to parts and to the whole, relation in forms, species, areas, colors, masses, that make patterns in space.

As the foliage of a plant outlasts its flowers one may value foliage more than flowers. From its multitude of cool and warm greens and from its soft grays, backgrounds of exquisite tonal beauty, masses and ground covers can be contrived. The varying forms of the leaves and the shadowy interstices between them give scale to these masses and boundaries and add a new interest, texture, to garden design.

I have spoken of space as an essential element in garden design but gardens exist also in light, and so light must become a considered element in your designs. Variations in its intensity soften contours, and contrasts of light and shade caress and delight the eye. Moving shadows add the semblance of life to static forms and, as they pass, alter colors from cool to warm, from warm to cool. In shadows are best revealed subtleties of colors and tones, and in shadowy depth the eye finds repose. Contrasts of light and shade have dramatic potency that you will use to arrest attention, to surprise and to arouse emotion.

It will be your task in projecting your botanical knowledge into visible forms to relate colors of flowers, shapes of flower masses and foliage areas and accents in spatial patterns that will add the spiritual beauty of abstract design to floral beauty.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Survey Of Some Of The Year's New Books On Vegetables

By Edwin Beckett

Vegetables, Fruits, and Flowers

GROW YOUR OWN VEGETABLES. Paul W Dempsey. 184 pages, illustrated, indexed. Houghton Mifflin Company, 2 Park St, Boston, 1942. $2.

An excellent book, well arranged, full of valuable information for the vegetable gardener and dispensed by one who knows how and why. Chapter 2 has in it a lot of sound advice, particularly that part of it relating to size.

In addition to the necessary instruction for the successful cultivation and harvesting of vegetable crops there are also chapters on small fruits and flowers which are timely.

"How to—" in Pictures

THE FOOD GARDEN. Laurence and Edna Blair 147 pages, illustrated, indexed. The Macmillan Co., New York, 1942 $2

Another "How to do it" book on vegetables, salads, fruits, etc. Profusely illustrated, showing by line drawings many of the operations described in the text, the various vegetables and diseases and pests attacking them. Particular stress is laid on this last phase with methods of control.

A more complete and definite selection of varieties would make the work more helpful to the beginner.

Bio-Dynamics

GROW A GARDEN AND BE SELF-SUFFICIENT. Ehrenfried Pfeiffer and Erika Riese. 118 pages, illustrated, indexed Anthroposophic Press, Inc., New York, 1942. $1.25.

A small work on vegetable gardening, containing the usual cultural methods and general information coupled with additional instruction for the carrying out of the authors' Bio-Dynamic method of soil treatment. Certain preparations, presumably of their own compounding and referred to by number, are suggested for use in carrying out this method of soil and plant stimulation biologically.

The Bio-Dynamic method would probably appeal to certain advanced amateurs with a flair for experimentation but hardly the system for a novice to follow.

To Refresh the Gardener

VEGETABLES IN THE GARDEN AND THEIR LEGENDS. Vernon Quinn, 257 pages, illustrated, indexed. J. B Lippincott Co., Philadelphia-New York, 1942. $2.50.

Among the many books on vegetable culture, with their chapters on vitamin content, cooking recipes and what-not that have appeared recently this one comes as a refresher. It does not deal with the prosaic.

As the title suggests, this work is woven around the many legends and superstitions connected with many of our present-day vegetables. It also contains much historical data, gleanings from old medical prescriptions and herbals. A chapter on "Recipes to Try," in which the author states "the result may be more than surprising" would seem to bear out that statement.

Good reading for anyone that knows a colewort from an aubergine.

Growing Asparagus

ASPARAGUS PRODUCTION. Homer C Thompson 123 pages, illustrated, indexed. Orange Judd Publishing Co, New York, 1942. $1 25

This small book on asparagus production would be a decided asset to anyone contemplating the growing of this valuable vegetable. The subject is covered thoroughly and authoritatively, from soil preparation to the ultimate sale of the crop, by an author of repute.

For those intending the cultivation of asparagus on a large scale, particularly for market, this work should be on the "must" list.

Chiefly Vitamins

GARDENS FOR VICTORY. Jean-Marie Putnam and L. Virginia Cosper. 221 pages, illustrated, indexed. Harcourt, Brace & Co., New York, 1942. $2.50.

Like many of the recently published books on vegetables for victory, stress is laid on the vitamin content of those under discussion here. A chapter on "Eat your beauty and have it too" contains some novel suggestions and also some novel plans.

The author also presents some ideas that are by no means commonplace and worth considering.

The disease and pest chart is good.

Growing, Cooking, and Canning

25 VEGETABLES ANYONE CAN GROW. Ann Roe Robbins. 219 pages, illustrated, indexed Thomas Y Crowell Co., New York, 1942. $2 25.

Written for the home gardener who has decided to make the plunge and, as you are informed, confined to 25 kinds.

There are two points in particular I like about this book. One is the arrangement. Each vegetable under discussion has the details, in each of the 25 chapters,

arranged in the same order, such as history, food values, culture, habits of growth etc. It makes reference easy. The other point is that the author does not issue too grave warnings on the pests and diseases; in fact, in places she seems to dispose of them very easily.

There are a few weak spots but of minor importance. Incidentally, in vegetable chapter 1, Asparagus, it is stated that this vegetable cannot be grown in frost-free sections of the country as frost is necessary to produce dormancy. Over one half of the U. S. asparagus crop is grown in California where much of it has its dormant period induced by the withholding of water as the temperature seldom goes low enough to prevent growth the year round.

Contains, what appears to the lay mind, some excellent cooking recipes and instructions for canning.

Tomato Facts and Factors

THE TOMATO. Paul Work. 135 pages, illustrated, indexed. Orange Judd Publishing Co, New York, 1942. $1 25.

A treatise on the tomato by an expert. This book contains the records and findings of the author who has devoted many years to the study of this important vegetable, combined with the results of other acknowledged workers of repute.

An excellent work for the grower, particularly if contemplating entering the commercial field.

On page 76 under "Cultivation," the author in referring to experiments by Thompson states, "—found that stirring the soil gave no significant increase in yield over mere scraping sufficient to destroy weeds. It is pretty hard to convince many old time gardeners of this. The value of dust mulch for conservation of moisture has been pretty well discredited by experimental comparisons." I think there will be others than old-time gardeners who will find this statement unconvincing.

Sound Advice For Gardeners

THE POCKET BOOK OF VEGETABLE GARDENING. Charles H. Nissley. 246 pages, illustrated. Pocket Books, Inc., New York, 1942. 25c.

Not a large book but packed full of sound advice and presented in a way that anyone can follow with ease. The illustrations are many and very descriptive.

Not the least important part is the information given preceding the cultural instructions of each of the vegetables. This includes, amongst many other items, seed sanitation where necessary, the relative vitamin content of the vegetable, and calorific value. Selection of varieties is confined to the best and is up to the minute.

No one could go wrong by following the instruction this book provides. It was issued also as "Home Vegetable Gardening" by the Rutgers University Press, and in its larger form bound in cloth instead of paper, it sells for $1.50.

Horticulturist and Physician Of America's Early Years

DR. BARD OF HYDE PARK. J. Brett Langstaff. 365 pages, illustrated indexed, bibliography E. P. Dutton & Co., New York, 1942. $3.75.

The subject of this interesting biography is best known as one of the founders of American medicine. Born in Philadelphia in 1742, he was brought to New York three years later by his father, Dr. John Bard, an eminent physician, who established himself in the rapidly growing metropolis on the advice of his friend Benjamin Franklin. The younger Bard studied at King's College, the forerunner of Columbia University, and was then sent to Edinburgh for his medical education. Before his return to New York the young student had already attracted the attention of the medical world by a Latin thesis on the effects of opium and had won a medal "for the best herbarium of the indigenous vegetables of Scotland." After four years of severe training, Dr. Sam Bard soon went to the forefront as physician, surgeon, and teacher of *materia medica* in New York, and became the trusted friend of many great personalities of the Revolutionary generation. In 1789 he was called as the most skillful surgeon available to remove a malignant carbuncle from the thigh of General Washington, and he saved the life of the First President at a moment when no other leader could have steered the young republic into unity.

More important even was Bard's role in the history of social medicine and medical instruction, and though at the age of fifty-six he retired to the ancestral estate up on the Hudson at Hyde Park, he continued to play a leading part in the medical institutions and welfare and scientific organizations of the city and state.

As a student in Edinburgh, Bard became well acquainted with the Physick Garden of the university there and tried to establish one in New York. His hope seemed to be realized when his young associate, David Hosack, bought the Elgin Garden, where Rockefeller Center now stands, and built greenhouses for exotic medical plant material. Mr. Langstaff gives in detail the history of Bard's gallant though unsuccessful fight to perpetuate this institution. When it failed, he was able to transfer many of the exotic plants to his "physick garden" at the New York Hospital.

Samuel Bard's interest in horticulture was not only medical. In Edinburgh he had drawn the plans for his father's estate at Hyde Park and these were carried out by a gardener whom he sent over. After his retirement there he devoted himself to the development of the park and garden; by 1806 the latter had reached the form which it still retains in the main as the National Historical Site of Hyde Park.

SARAH GILDERSLEEVE FIFE.

"Bread-and-Butter" Book On Plant Propagation

PROPAGATION OF PLANTS. M. G. Kains & L M McQuesten 625 pages, illustrated, indexed. Orange Judd Publishing Co., New York, Second edition, 1942. $3 50.

Here is a book which not only covers all phases of plant propagation and fruit tree stocks in a very thorough manner, but which also contains chapters on greenhouse and nursery management, planting of orchard trees, and methods of pest control which are up to date in their recommendations.

It is profusely illustrated. There seems to be no operation in the propagation of plants, the necessary tools, and methods of handling which is not pictorially presented.

In order to publish the latest information on recent developments in the field of propagation, the authors have included an appendix covering 75 well illustrated pages. Anyone who possesses the 1938 edition will find a wonderful source of up-to-the-minute information in this appendix.

This book is not only a "must have" for practical plant propagators and nurserymen, but I don't know of any better book for student class work. One chapter contains a list of 50 practicums which present invaluable aid for the conduct of laboratory exercises. The thoroughness of this phase of the book is clearly demonstrated by the fact that 60 pages are devoted to the step-by-step suggestions of these practicums.

The extensive bibliography adds greatly to the book's value as a reference guide for teachers and students as well as for progressive nurserymen and propagators. There is also a double-column index of 30 pages.

Fortunate will be all those students whose introduction to plant propagation and nursery management will be attained by the knowledge contained in this "bread and butter" book.

I congratulate the authors on their achievement.

HENRY M. BIEKART,
New Jersey Agricultural Experiment Station.

Plant Anatomy Up to Date

PRACTICAL PLANT ANATOMY. A. S Foster 155 pages, indexed. D Van Nostrand Co, New York, 1942 $2.50

This little book is neither quite a textbook nor merely a laboratory manual, but a bit of both. It is intended for students in courses in plant anatomy, and should be invaluable to them—there is nothing else like it. The fourteen chapters deal with the usual topics and each begins with a review of the present state of knowledge in that field, with selected references to texts and to original papers. These excellent introductions are the most valuable feature of the book. Current problems are expounded briefly and clearly, so that the student should be able to tackle the reading of original work with some understanding. The treatment emphasizes functional and developmental aspects of anatomy, which becomes much more than the usual catalogue of names.

It is natural that this author should

devote to meristems a space which some will think disproportionate; yet it seems that this subject should have even fuller treatment Some students will wonder what has become of the older concepts which they have been taught. The able discussion of classification of cell types will surprise some teachers who have not realized what a vast muddle can exist in botanical thought. The only disappointment in the book is the lack of anything on flowers. Many teachers include at least a brief introduction to floral anatomy.

The pages are held by metal rings; an arrangement which I trust is practical in some way not apparent to me. The book is repulsively covered in a red rubbery material; in spite of which I should without hesitation adopt it if I were teaching plant anatomy.

H. W. RICKETT.

From Ohio State University

WORK BOOK IN GENERAL BOTANY. H C Sampson 242 pages, illustrated Harper & Brothers, New York, 1940 $1 75.

An exceptionally complete loose-leaf laboratory work-book, with explanatory charts and figures, questions to be answered and diagrams to be labeled. Because of the scope of included material, this work book can be adapted to almost any type and intensity of teaching, although it was prepared primarily for use with the Ohio State University's Textbook of Botany by Transeau, Sampson and Tiffany, reviewed in the January 1942 issue of this Journal.

CHARLES L. GILLY.

Another Textbook

PLANT BIOLOGY. Paul Weatherwax. 455 pages, illustrations, glossary and index W B Saunders Co., Philadelphia & London, 1942. $3 25.

This is another textbook designed to overcome some of the disadvantages of the average elementary botany text, but the book is neither as well organized nor as well illustrated as others that have recently appeared. Furthermore the writing is, in many places, cumbersome and vague. This fact is certainly not commendable in an elementary text. There are several other superior elementary botany texts, in this reviewer's opinion.

J. H. PIERCE.

New Edition of Hottes' Trees

THE BOOK OF TREES. Alfred Carl Hottes. 440 pages, illustrated, indexed. A. T. DeLaMare Co, New York New edition 1942 $3.50.

The appearance of a revised edition of The Book of Trees by Alfred C. Hottes is disappointing because of lack of actual revision and the lack of new material that would be necessary to bring the book up to date. Actually, one illustration has been changed and the chapter on Feeding Trees has been revised. The rest is substantially the same book as printed in 1932

The numerous errors in nomenclature continue. The scientific name for the Japanese flowering cherry (*Prunus serrulata*) is listed as *Prunus cerasus japonica pendula*, the name for the European wild cherry with a latinized varietal ending. It is confusing to find the European white birch called *Betula pendula* in one instance and *Betula alba* elsewhere.

Several lists of trees still contain erroneous information. *Amygdalus Davidiana* is listed as tender. The tulip-tree is labeled *Liquidambar* on page 59, and under small trees are found *Cladrastis lutea* and *Quercus Cerris*, both of which are over 45 feet high at the New York Botanical Garden. *Chionanthus retusus* is listed as flowering a week later than the other fringe-tree, *C. virginicus*, when it actually is that much earlier here.

The author states, "At the present time one of the most scarce of nursery items is Koster's Blue Spruce." Every nurseryman knows that this is no longer true. Except for such errors as these, however, for the amateur gardener interested in trees, much in this book will be useful, especially the descriptive notes after each genus.

RALPH PINKUS,
Arboretum Foreman.

Conserving the Gardener's Labor

GARDEN EASILY. H K. Morse. 208 pages, illustrated, indexed. Charles Scribner's Sons, New York, 1942. $2.50.

This pleasantly written book by Mrs. Morse seems to this reviewer just to miss the standard of excellence set in her former book, Gardening in the Shade. However it offers many useful suggestions of planning and planting to help keep down the upkeep in garden maintenance—

an important item in these times of stress. The merits of a simple layout are noted, and a good word is given for paved areas and ground-cover plants in places where good grass cannot be maintained.

The fundamentals of proper soil preparation are briefly but clearly stated. Thorough spade-work is essential but not easy, but the easy time comes later if the foundation work has been well and truly done. Good-natured trees, shrubs, vines, roses, perennials, annuals, and ferns are listed and briefly described, but one misses mention of a number of good reliable garden occupants. The pin oak should surely have a place in any select list of trees, and yellow-wood too, with its year-around good form and the beauty of its bridal array of fragrant flowers in late spring. Under Bellflower, *Campanula* should feel slighted, only three being mentioned, and of these two would soon disappear from the average border. The good stout reliables pass unnoticed—but then, not all good things can be mentioned in trying to cover so much territory in a limited space. The suggestion to allow hedges of yew and hemlock to go unclipped is not good from the point of view of having a good hedge. Both are beautiful in the natural state of free growth, but when planted in hedge formation must have one trimming a year to be kept well furnished and within bounds.

Gardens in general will be more satisfying when more attention is given to plant selection for the various situations to be treated, and in that connection this book will help in the right direction. The photographic illustrations are very well done.

HENRY E. DOWNER,
Vassar College.

A "Speaking" Garden Book

WAKE UP AND GARDEN. Ruth Cross 326 pages illustrated, indexed. Prentice-Hall, New York, 1942. $2 95.

I find Ruth Cross's "Wake up and Garden" a treasure: it is indeed, a "speaking" garden book, with practical advice, and, on almost every page some beautiful, or helpful thought that makes one realize the necessity of flowers, vegetables, and all green things to make the ideal world we all want.

SARAH A HODSON,
Greenwich, Conn.

Monumental Work On Arizona's Vegetation

FLOWERING PLANTS AND FERNS OF ARIZONA. T. H. Kearney and R. H Peebles (and collaborators). 1,069 pages, illustrated (29 plates and frontispiece), indexed. U S. Dept of Agriculture Misc Publ. 423 May 1942. $2.

This is the second volume published within the last two years that can truly be called a State Flora, the other being Deam's Flora of Indiana. Approximately 3,200 species are included, and certain of the "more difficult" families and genera have been treated by recognized experts in these particular groups. The diversity and complexity of the Arizona flora is due primarily to the range of altitude and climatic extremes within the state, and the complexity of ecological habitats resultant from these two factors.

Forrest Shreve has contributed an interesting and informative discussion of the vegetational types within the state; of particular interest is the portion on the "microphyll desert" and the all too brief section on the vegetation of the Grand Canyon. The illustrations, both the general vegetation views and the individual plant portraits, are definitely better-than-average photographs. The very least that can be said of this volume is that it is a splendid contribution to North American botany; and that it represents a standard of excellence, usefulness, and useableness which should be the goal of authors of future State Floras.

CHARLES L. GILLY.

Botany and Everyday Life

THE PLANT WORLD. H J Fuller. 592 pages, many illustrations, glossary and index. Henry Holt & Company, New York, 1941. $3 25

A well organized textbook designed to present the cultural and educational aspects of botany rather than the basic materials for a professional botanical career. The field is adequately covered with particular emphasis on the relation of botanical principles to everyday life. The economic aspect of plants, especially important now, is consistently presented throughout the text. Of particular help to the student are the summaries of each chapter and the boldface printing of botanical words or terms.

J. H. PIERCE.

Notes, News, and Comment

Pest Control Course. Although the rationing of gasoline in the eastern states made traveling to the New York Botanical Garden impossible for many, 20 persons came to the new Two-Day Short Course in Disease and Pest Control given June 2 and 3. Of these, one came from West Virginia, one from Long Island, four from New Jersey, six from Westchester County, and eight from New York City. The course was arranged by Dr. B. O. Dodge and the instruction consisted of lectures followed by demonstrations, practice periods, and questions. Dr. P. P. Pirone opened the first morning session by speaking on the nature and causes of plant diseases as determining particular methods of control. He was followed by Dr. C. C. Hamilton, who described some of the common insect and other animal pests in the home garden and told what can be done to prevent damage by them. The accompanying demonstrations included the mixing and applying of sprays and the care of equipment, soil sterilization, and care of lawns. The second day was shared by Dr. E P. Felt, who spoke on the care of ornamental trees and shrubs, and Dr. Cynthia Westcott, who handled the subject of sanitation in the home garden and other important steps in disease and pest control. Dr. Felt directed field work in the recognition of injury to trees and shrubs by insects and disease and explained how to prune and treat trees to prevent further injury, and Dr. Westcott followed with the identification of common diseases and pests and instruction in the handling of equipment for sprays and dusts.

Food Values. Two free lecture-demonstrations were offered to members, students, and friends of the New York Botanical Garden June 23 and 30 by the Consolidated Edison Co. of New York. The topics covered included the nutritional values of fruits and vegetables and their proper preparation to preserve their vitamins and minerals. The Garden participated as part of its Educational Program with particular reference to its Victory Garden work. Seventy persons applied for tickets of admission.

China. Twenty-five scientists from China who are now in New York have organized the first American chapter of the Science Society of China, an organization with 3,000 members in the Orient. Roberta Ma of the New York Botanical Garden is Secretary. Other officers are John Y. C. Watt of Cornell Medical Center, President; C. M. Soo-Hoo of Presbyterian Hospital, Vice-president; and Raymond Yoh of the Bank of China, Treasurer. Monthly meetings are held at International House.

Groups. Among the group visitors to the Garden during June were the eastern branch of the American Chemical Society on annual outing, June 6; the National Association of Gardeners June 10; photographers' group from the American Museum of Natural History, June 20; and some students from Demarest High School, Hoboken, and from the Ethical Culture School, New York, June 9 and 10.

Visitors. In addition to the botanists who came to the Garden June 23 in celebration of the Torrey Club's 75th anniversary, recent visitors have included Paul B. Marsh, Cornell University; Richard A. Howard, Gray Herbarium; Stanley A. Cain, University of Tennessee; Wanda K. Farr, Greenwich, Conn.; Ruth Schornherst of the University of Florida, who spent two weeks in the early summer working in the cryptogamic herbarium; M. L. Fernald, head of the Gray Herbarium, who worked in the Britton Herbarium July 8 and 9; and William Seifriz of the University of Pennsylvania, who visited Dr. William J. Robbins July 12.

Scholarships. Anita G. Appel, a 1942 graduate of the University of North Carolina, is working at the Botanical Garden this summer on a two months' scholarship, undertaking problems in plant breeding and genetics under Dr. A B. Stout. Miss Appel was a volunteer worker at the Garden last summer.

Miss Esther M. Zimmer, a Hunter College graduate and a volunteer in the pathology laboratory last summer, is working for Dr. B. O. Dodge, also on a two months' scholarship this summer. Miss Zimmer was the recipient of a month's Botanical Garden scholarship during the past school year.

THE NEW YORK BOTANICAL GARDEN

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To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

MEMBERSHIP IN THE GARDEN

Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests. Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public.

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia once a year, each number illustrated with eight colored plates of unusual plants, accompanied by descriptions.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

(4) Announcements of special floral displays, programs, lectures, and other events at the Garden.

(5) Credit to the amount of the membership fee paid, toward courses of study offered by the Garden.

(6) The privilege of borrowing lantern slides from the Garden's collection.

(7) Use of the Members' Room in the Museum Building.

A limited number of garden clubs are accepted as Affiliates. The privileges of affiliation are one lecture a year by a member of the staff, a share in the distribution of plants when they are available, a subscription to the Journal and to Addisonia, and announcements of special activities at the Botanical Garden. In addition, any member of an affiliated club may receive for the current year of membership a reduction of $5 in the fees paid for instruction. (This does not apply to the course for professional gardeners.) An Affiliate Garden Club may borrow lantern slides from the Garden's extensive collection, such loan being subject to the regulations for the use of lantern slides by individual members. Likewise, an affiliate club may engage without fee the Members' Room at the Garden for its meetings.

The classes of membership are as follows:

Annual Member	annual fee	$ 10
Sustaining Member	annual fee	25
Garden Club Affiliation	annual fee for club	25
Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
Patron	single contribution	5,000
Benefactor	single contribution	25,000

Fellowships or scholarships for practical student-training in horticulture or for botanical research may be established by bequest or other benefaction either in perpetuity or for a definite period.

Contributions to the Garden may be deducted from taxable incomes. The following is a legally approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————————.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York, N. Y.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

HAVEN FOR THE ARMED FORCES

MEN in uniform are as frequent a sight these days at the New York Botanical Garden, comparatively speaking, as they are on the streets of downtown New York Not a few of them make this Garden, with its acres of woodland, its colorful beds and borders of flowering plants, and its extensive greenhouses filled with exotic plant material, one of the points to visit when they are on leave in New York. Often they bring with them a folded paper containing a bit of a plant for which they hope to find a name . . something unfamiliar that they have picked up in a part of the country with which they were unacquainted.

Scarcely a week goes by that some former student gardener, now in the Nation's service, does not make a return visit to the Botanical Garden, spending one day here out of his three or four days' leave Many who do not get back to New York write to their friends and former teachers here, commenting on gardening in other parts of the world or asking for information which the Garden can supply.

A member of the British Navy comes to the Botanical Garden whenever he has shore leave, investigating every portion of the grounds and greenhouses, particularly the Thompson Memorial Rock Garden Members of the gardening staff have gradually learned from him that he left behind him in Middlesex, where he used to be a banker, a large collection of alpine plants, for which he had won many prizes at shows, and that he was one of the most active among the members of his local as well as a national horticultural society. Another British fighter, a member of the Royal Air Force, also has made frequent visits to the Botanical Garden and has found it a place of great satisfaction, not only because of the relief it offers from the actuality of war, but also because of his own horticultural interests.

An American Navy man who is fond of botany consults with a staff member regularly on visits to the Garden when he has shore leave. Through the Garden he is able to foster his hobby as actively as though he were at home.

A boy from Alabama, a former student who is now in the Army, spent a happy day at the Garden acquainting himself for the first time with the workings of a large herbarium.

These are but a handful of the men in uniform for whom the New York Botanical Garden is a special sort of wartime haven.

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THE NEW YORK BOTANICAL GARDEN

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Plants Used By The Dominica Caribs

By W. H. Hodge
Department of Botany
Massachusetts State College

ON out-of-the-way Dominica, the largest of the British Lesser Antillean isles, lives the last band of the native West Indian aborigines —a mere handful of Island Caribs. Columbus, on his second voyage of discovery, found the Caribbee Islands well populated with these short-statured aggressive Indians whose pugnacity was such that for many years the Spaniards hardly dared set foot again on any of the southern islands. Later incursions of the English and French eventually obliterated most of the stubborn Carib islanders with the exception of two small bands which were allotted remote reservations on the rugged volcanic isles of Dominica and St. Vincent. A catastrophic eruption of the Soufrière eliminated nearly all of the St. Vincent group with the result that today Dominica alone can boast of being the last home of Antillean aborigines.*

Dominica's Caribs are also on the verge of extinction—chiefly because of miscegenation with the island's negro population—and indeed only half a hundred inhabitants of the Carib reserve are considered to be of full-blooded Indian stock. Concomitant with diminishing numbers has been the loss of native customs. For instance, Caribs no longer speak their own tongue but rather the patois of the Creole negro**; Caribs no longer make or use bow and arrows, no longer paddle their canoes (but rather row or sail them), and no longer spin cotton or make hammocks. Further, Caribs no longer rely entirely on their heritage of native economic plants but have borrowed a goodly sampling of the abundant alien species so

*For certain ethnological material the writer is indebted to Mr. Douglas Taylor, ethnologist and co-author of "The Economic Botany of the Dominica Caribs," now in preparation.

**Although many of the earlier truly Carib names are known, the more familiar Creole patois names have been largely used in this article

frequently cultivated throughout the Antilles. Little is known and even less has been written concerning the aboriginals with the result that many of the customs of these vanishing Indians will never be recorded. Recent plant collections in Dominica are clearing up the identity of many economic species long used in the everyday life of the early inhabitants.

The Caribs' homeland consisted originally of fully forested islands. Even today a few of these like Dominica possess enough of the original vegetation types to show what existed in pre-Columbian times. Three main vegetational zones can be distinguished. The coastal zone (the region under 1,000 ft. elevation) with its low tropical forest, often semi-xerophytic (particularly on the leeward side), was undoubtedly the site of the Carib settlements, for islanders like these would hardly live far from the sea, which was to them a prime source of food. Above the 1,500 ft. altitude level is a region of heavy precipitation and of high and massive rain-forests. What game exists in the islands lives chiefly in this zone, and so it too was familiar territory to the hunter seeking wild pigeons, parrots, agouti, and manicou (opossum). The fisherman must also have known the "high woods," for in them are to be found many of the tree species used in the fashioning of canoes. Finally, upon the cloud-shrouded ridges and summits of the interior peaks is a low-statured, wind-swept, and impenetrable mossy-forest, probably seldom if at all visited by Lesser Antillean aborigines.

DOMINICA AND ITS SURROUNDINGS IN THE CARIBBEAN

(Used by courtesy of Miss Levett Bradley and of Natural History Magazine, where the map appeared in June 1941.)

HOME LIFE AMONG THE CARIBS

1. Hollowing out a utensil from a calabash (Crescentia Cujete).

2. A Carib kitchen shelter.

3. An old Carib woman scraping the tubers of manioc (Manhiot esculenta).

All photographs are by the author

MANIOC (*Manihot esculenta*) still is the chief crop plant of the Island Carib, and it is amazing that Indians should have discovered that a poisonous species such as this could with proper preparation be rendered non-toxic. Several varieties of this tuberous species are known and grown. Preparation of the tuber for food includes removal of the outer skin by scraping, grating, squeezing (in order to remove the poisonous juice), and drying. The resulting meal, sifted to the requisite fineness, is either used to make cassavas (large flat baked pancakes, one to two feet in diameter), or farine (a loose manioc flour also prepared by baking). Other native cultivated tubers are TANIAS (*Xanthosoma* spp.),

IN THE HIGH FORESTS OF DOMINICA

1. A "poirier" tree (Tabebuia) in full bloom.

2. The giants of the Dominican forests are the "gommier" trees (Dacryodes excelsa). Full-sized grapefruit trees are growing at their feet.

4. Familiar timb trees of the Dominic rain-forest. At rigl "bois côte" (Tapura a tillana); left: "carapet (Amanoa caribaea).

3. The trunk of the "gommier" yields a fragrant gummy exudate used by the Caribs for torches.

5. Carib canoe fashioned from a "gommier," undergoing spreading by means of stones and fire.

and sweet potatoes (*Ipomoea Batatas*); while a wild edible yam, WAWA (*Rajania cordata*), is also frequently sought out.

Certain well known native Antillean fruits have been long used by the Caribs. These include guavas (*Psidium Guajava*), pineapples (*Ananas sativus*), cashews (*Anacardium occidentale*), mamee-apples (*Mammea americana*); also species of the genus *Annona*—the COROSSOL or soursop (*A. muricata*), the CACHIMAN, or custard-apple (*A. reticulata*), and the POMME-CANELLE or sweetsop (*A. squamosa*). Included among less familiar types are an edible passion-fruit known as POMME LIANE (*Passiflora laurifolia*); the pulpy leguminous pods of the trees known as POIS DOUX (*Inga laurina*), POIS DOUX MARRON (*Inga ingoides*), and COURBARIL (*Hymenea Courbaril*); Z'ICAQUE (*Chrysobalanus Icaco*), and the fruits of the forest trees called BOIS CÔTE (*Tapura antillana*), BOUIS (*Chrysophyllum argenteum*), and BALATA (*Manilkara nitida*). All these native fruit-bearing species, with the exception of the three last-named forest trees, are to be found growing close to the coast.

Encroachment of the white race has brought to Carib gardens many important introduced food plants such as bananas, breadfruit, cocoa, coffee, dasheen, mangoes, plantains, and cultivated yams. In many cases these economic plants have replaced in cultivation less important native plants, and indeed have caused diminishing production of even the staple manioc.

Hunting with the bow (fashioned from the palm, LATANIER—*Coccothrinax martinicensis*) and arrow (made from the stems of the reedy grass, ROSEAU —*Gynerium sagittatum*) is a lost art to the present-day Carib, who now uses dogs, snares, or birdlime—the white sticky sap of a tree called LAGLI (*Sapium caribaeum*). On such forest escapades the Carib hunter need never lack refreshment and it may be the cooling drink from the cut stem of a high climbing vine, CORDE DE L'EAU (*Doliocarpus calinoides*), tasty crispy "cabbage" from the terminal bud of the tall endemic PALMISTE (*Euterpe dominicana*), or fruit from the BOIS CÔTE, the forest tree with the "muscle-bound" trunk. If he stays in the woods for long, fire is needed. This is started from tinder and sparks struck from a primitive sort of flint and steel. Oftentimes fire is carried preserved in the peat-like rhizome of the common tree-fern (*Cyathea arborea*). And if a light is needed either for hunting, fishing, or in the home, fragrant torches (FLAMBEAUX) may always be fashioned either from the abundant gum obtained from scraping the trunk of a giant GOMMIER (*Dacryodes excelsa*), or from the resiniferous wood of the small coastal tree known as BOIS CHANDELLE (*Erithalis fruticosa*). GOMMIER torches made by molding the aromatic gummy exudate around a wick made of the pounded wood of tree-fern or BOIS DIABLE (*Licania ternatensis*) are long-burning (ten hours), whereas the BOIS CHANDELLE torches—really nothing but

Tree-ferns (Cyathea arborea) of Dominica. Fire is often carried by hunters in their rhizomes.

bound fascicles of the split wood of this species—last for only one or two hours.

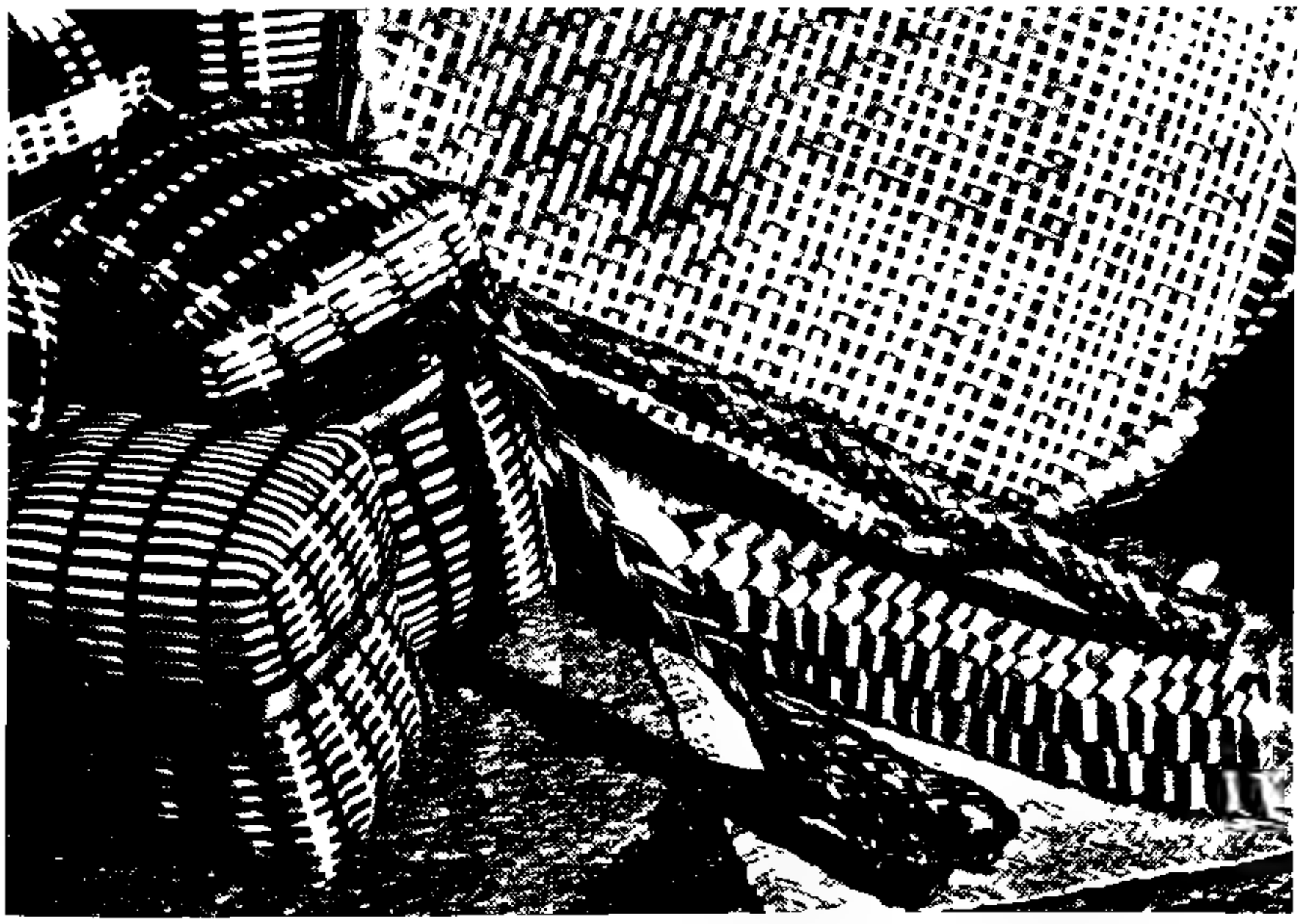
Unlike hunting, which is sporadic, fishing is a daily task, for fish constitute the principal meat, and plants play important parts in the daily success of West Indian Izaak Waltons. Small river fish are tasty but hardly to be caught with either hook or net in the small, rushing, boulder-strewn streams. The answer to this is the fish drugs obtained from three different plants—one from the leaves of the shrubby Composite known as ENIVRAGE (*Clibadium sylvestre*); another from the bark or fruits of a tree called BABARRA (*Diospyros Ebenaster*); still another from the bark of a forest tree known as BOIS CICERU or BOIS PIPIRI (*Pithecellobium Jupunba*). Pounded ENIVRAGE leaves are thrown into a river pool by Carib women who hastily catch all the fish which jump out of the water

in order to escape the poison. BABARRA bark and fruits are also crushed but so strong is this concoction that it is normally placed in a basket which is submerged for only short periods. Long immersion would cause the river pools to be poisoned for more than a week, and this would destroy future supplies.

Most profitable fishing is in the deep blue swells of the rough Atlantic where for centuries Carib fishermen have sailed and fished with the result that the average Indian is as fine a sailor of small craft as can be found anywhere throughout the Caribbee isles. In eighteen foot canoes (KURIALA) he thinks nothing of sailing thirty miles to the French islands over the roughest of seas, but then his ancestors thought nothing of plying their many-paddled, forty-foot KANAWA (whence our modern word canoe) to the South American continent.

Not only does the Island Carib sail canoes but he also makes them, from the slate-gray trunks of giant GOMMIERS*, one of the largest trees of the interior forests. The manufacture of a canoe is a month-long process. It entails felling the tree, hollowing the trunk, hauling the rough shell to

*According to early chroniclers Carib canoes were originally made from a tree called ACAJOU (probably *Carapa guianensis*).



PRODUCTS OF THE CARIB BASKET-MAKER

To the left are nesting baskets made of "larouman" (Ischnosiphon Arouma), in the right background, a cassava sifter; in the right foreground, lying on a fan, are children's toys—two larouman "finger-traps" flanking a "musique" of coconut leaves.

CARIB BASKETRY

1. Large paniers being woven from split stems of "larouman" (Ischnosiphon Arouma). These baskets are made rainproof by leaves of Calathea or Heliconia placed between lining and covering.

2. The horizont tie-roots of this A thurium, s h o w grasping the tru of its supportin tree, are used making round-bas baskets.

3. Inflorescence "balisier" (Helic nia caribaea), who leaves are used, described above, basketry.

4. Stilt-roots of the "palmiste" (Euterpe dominicana) are also used to make sturdy round-based baskets. This is the same palm whose terminal bud is eaten under the popular name of "cabbage."

the coast, and there putting on those touches which change it from a mere dugout to a finished KURIALA. "Spreading" is the first operation. Low paralleling fires are built along each side of the dugout, which is usually piled high with large stones. Under this weight and under the influence of the gentle heat, the craft-to-be spreads wide like an opening flower, whereupon ribs and thwarts—usually of POIRIER (*Tabebuia pallida*)—are inserted. "Spreading" causes loss of depth so hewn GOMMIER boards are added, thus building up the sides and making the boat more seaworthy. Although Carib canoes were formerly paddled, square-sails now drive the Indians' craft. One or two masts (made of BOIS CÔTE) are the general rule and these are supplemented by simple paddles hewn from the tough wood of either QUINA (*Exostemma* spp.) or BOUIS.

Besides a canoe-maker, the Dominica Carib is also skilled in basketry, and through the manufacture and sale of these two products he gets what little "pin money" is available. Basket types are as variable as the basket materials, all of which are of plant origin. LAROUMAN (*Ischnosiphon Arouma*), a tall reedy plant often semi-cultivated in small streamside plots in the wet forest, is the source of material used in the finest baskets or paniers. From the sun-dried, rusty-colored, split stems beautifully worked and designed, rain-proof baskets are made, and these may vary from large trunksize affairs to tiny miniatures a dozen of which may be fashioned as a set to nest one within the other. All LAROUMAN baskets are double, two baskets in one, with the inner layer sewn to the outer "skin" with strong homemade twine of LA PITE (*Bromelia Pinguin*), and separated by a carefully arranged rainproof layer of broad BALISIER (*Heliconia Bihai* and *H. caribaea*) or CACHIBOU (*Calathea lutea*) leaves.

Other household articles are (or were) also woven from LAROUMAN; among these are baskets for storing eggs, cassava sifters (HEBICHETS), cassava squeezers, and finger traps. The split stalks of ROSEAU are the most frequent edging or binder for baskets of LAROUMAN. Although these baskets are generally rectangular, the Caribs do make strong round-base provision or market baskets chiefly from the stout climbing stems of such local woody lianas as LIANE POMME, LIANE GRISE (unidentified), or CALABOULI (*Stigmaphyllon puberum*). Such material requires little or no preparation, whereas the tie-roots of the scandent arums known as MIMBI (*Anthurium palmatum* and *Monstera pertusa*) are usually scraped before weaving. Baskets made from the latter species are often dyed in two colors, mauve (a color obtained by moistening the leaves of the native TAN, *Picramnia pentandra*), and yellow (a color that is procured from the root of the naturalized East Indian turmeric, *Curcuma longa*, locally known as SAFFRON). Carib pack-sacks are sturdy baskets, built to "take it." The rugged stilt- or prop-roots of the recently described palm, *Euterpe dominicana*, constitute the chief weaving material. Finally, several species introduced into the West Indies have been utilized by the contemporary Indian.

These include the split stems of common bamboo (*Bambusa vulgaris*)—used in the manufacture of market baskets and for a rigid basket-like net, called KALI, used in catching flying fish—and the leaves of the screw-pine (*Pandanus utilis*), here called BAKWA, and of VETIVER (*Vetiveria zizanioides*), both of which are fashioned either into hats or are used as thatch for shelters.

The Carib of today lives in a hut and seldom does one see the typical shelter of former days the MWINÃ, a pup-tent-shaped frame thatched with the leaves of the palm known as YATAHU (*Rhyticocos amara*). For strength against hurricanes, MWINÃS were often built double, one within the other. "Modern" Carib huts are built of local timbers. Set several feet off the ground on piles of MANG ROUGE (*Tovamita Plumicri*), or MANG BLANC (*Moronobea coccinea*), the dwelling usually sports floors and walls constructed of various hard woods (BOIS BANDE: *Richeria grandis;* BOIS RIVIÈRE: *Chimarrhis cymosa;* BOIS BLANC: *Simaruba amara*), and a shingled roof of either CACONIER (*Ormosia monosperma*), BOIS LEZARD (*Vitex divaricata*), or MANG ROUGE.

The only hangovers from the MWINÃ days are the kitchens which are crude separate structures (to lessen fire danger) with low boarded walls and mwinã-like roofs thatched nowadays with either coconut leaves (rather than YATAHU) or the straw from sugarcane or vetiver. Thatch may be tied to the cross-rods with MIMBI or CALABOULI or with stronger bark materials, which are, however, more frequently used as ropes. Such bark strips are obtained from various trees known as MAHO (or MAHAUT), among these being MAHO PIMENT (*Daphnopsis caribaea*), MAHO COCHON (*Sterculia caribaea*), MAHO NOIR (*Guatteria caribaea*), and MAHO DOUX (*Hibiscus tiliaceus*). When in the woods over night the huntsman invariably erects a temporary lean-to-like shelter known as an AJOUPA or KARBÉ, which is necessitated by the constant tropical rains. Quickly built and thatched either with the leaves of YANGA (*Geonoma dominicana*) or with those of the omnipresent climbing Z'ELLES MOUCHES (*Carludovica Plumieri* and *C. insignis*) the AJOUPA is ample protection against the average tropical deluge.

The yard or immediate surroundings of a Carib hut is a barren-looking stretch of red clay soil usually devoid of all greenery and swept as carefully with the homemade shrubby brooms of BALIER (*Sida* spp.) or LATANIER as is the interior floor. Near the hut or kitchen shelter are to be seen several of the necessary kitchen utensils, all of home manufacture. Among the most important of these are a wooden mortar and pestle generally constructed of either POIRIER or BOIS TAN (*Byrsonima spicata*). A simple wooden grid known as a BOUCAN, held up by forked sticks (constructed of GUÉPOIS: *Myrcia* sp., or BOIS D'INDE: *Amomis caryophyllata*), is another familiar object of all Carib yards, and is used for smoking and

A GRASS

"Roseau" (Gynerium sagit- is used for making arrow-

This "yanga," the best palm thatching, is a new species, dominicana.

3. Leaves of another thatching a," G. Hodgeorum.

leaves

brooms.

A scandent whose foli- is used on "z'elles hes" (Car- ica Plumi-

Plumi-

FLOWERS OF THE CARIBS' ISL

1. *Hillia parasitica, an tractive rain-forest vine.*

2. *Flowers of "calabo (Stigmaphyllon puberum) liana used in basketry.*

3 and 4. *Flowers and red-seeded fruits of "roku" (Bixa Orellana), a famous dye-plant, elsewhere known as "achiote" or "anatto."*

5. *Blakea pulverulenta, a ra epiphytic shrub of the Dominica rain-forest.*

6. *A giant bromelad of th mossy-forest zone, Glomerop cairnia penduliflora.*

drying fish and game. Civilized pots, pans, and dishes now replace the old calabash type, although utensils of various shapes and sizes made from the calabash (*Crescentia Cujete*) are still used for water-carrying and as odd bowls and cups.

Bordering on the yard are usually to be found numerous species cultivated for one household purpose or another: cotton (*Gossypium* spp.) used for calking canoes, stuffing pillows and mattresses, and formerly spun into thread; ANATTO or ROKU (*Bixa Orellana*), the bright red seeds of which are sometimes used as a source of coloring, but were formerly mixed with carapa oil (from the seeds of the forest tree, *Carapa guianensis*) to make a body paint and insect repellent; castor bean plants (*Ricinus communis*), oil from the seeds being used by the women as a hair shampoo; an arrowroot (*Maranta arundinacea*), known as L'ENVERS CARAIBE, whose root is considered important as a charm; calabash; and the pineapple-like LA PITE, source of a strong twine and fishing line.

In addition there are many edible species, not like manioc in requiring special garden space; such are coffee, cocoa, mangoes, papayas, sapodillas, pineapples, sugarcane, bananas, plantains, sweetsops and soursops. And planted among all these economically useful species is many a well known tropical plant (species of *Acalypha, Euphorbia, Hibiscus, Croton,* and *Bilbergia*), whose presence betrays the fact that the Island Carib, like any other human, enjoys beauty for beauty's sake.

Notes on the History of the Botanical Garden And Its Predecessors in New York City

As Presented at the 75th Anniversary Celebration of the Torrey Botanical Club at the New York Botanical Garden, June 23, 1942

By William J. Robbins

ALTHOUGH The New York Botanical Garden was established by act of the Legislature of New York State in 1891, the idea of a botanical garden in the City of New York and efforts to establish one date back to the beginning of the last century.

The Elgin Botanic Garden founded in 1801 by Dr. David Hosack was purchased by the State in 1811 and then known as the Botanic Garden

of the State of New York. It was subsequently granted to Columbia College, but funds for its maintenance were not provided and it was ultimately abandoned. This garden occupied the area roughly bounded by 47th and 51st Streets and by Fifth and Sixth Avenues, where Rockefeller Center now stands.

The following quotation is taken from Loudon's Encyclopedia of Gardening, London, 4th edition, 1826:

> "Upon the revival of the medical school in Columbia College, in 1792, a chair of botany was established, and Dr. Mitchell was appointed Professor. Dr. Hosack succeeded Dr. Mitchell; and the result was, first, the latter professor's establishing a botanical garden at his own expense, and afterwards government purchasing it of him for the benefit of the medical schools of New York; and it is now known as the New York Botanic Garden.
>
> "The Botanic Garden of New York contains twenty acres; the first catalogue was published in 1806, and the second in 1811, containing nearly 4000 species."

About two decades later, another botanical garden was established in New York, though this was apparently more of a profit-making venture. We have in our library a "Catalogue of Ornamental Trees and Shrubs, Herbaceous and Greenhouse Plants cultivated and for sale by Thomas Hogg, Nurseryman and Florist at the New-York Botanic Garden in Broadway near the House of Refuge" published by G. P. Scott and Co. in 1834.

A letter from Mary E. Sparks, granddaughter of Thomas Hogg, written to Dr. Britton in 1916, says, "The New York Botanical Garden was at the southeast corner of 23rd Street and Broadway where the Hotel Bartholdi now stands," and adds that Thomas Hogg accompanied Dr. Torrey on many of his botanical trips, especially in New Jersey. This catalogue lists 40 ornamental trees, 120 ornamental shrubs, more than 250 perennial herbaceous plants, about 60 dahlias or "georginas," and 750 greenhouse and hothouse plants.

In 1877 the Legislature of the State of New York passed an act to facilitate the establishment of a Botanical Garden in the City of New York. The charter was granted to Samuel B. Ruggles, Robert L. Stuart and William E. Dodge. According to the *New York Daily Tribune* of April 26, 1877, the cost of preparing the garden for public use was estimated at from $300,000 to $350,000. It was proposed to locate this garden next to Central Park using Manhattan Square and several adjacent unoccupied lots. Shares of capital stock in the corporation were sold at $25 each but the attempt failed.

The New York Botanical Garden was established largely as the result of the vision and energy of Nathaniel Lord Britton, Professor of Botany in Columbia College, who became the first Director. Its beginning may be traced to the impression made on Dr. and Mrs. N. L. Britton by the Royal Botanic Gardens at Kew, England, where they had gone in the summer of 1888 to study a collection of plants made by Dr. H. H. Rusby in

Bolivia. At a meeting of the Torrey Botanical Club held in October 1888 Mrs. Britton gave a description of the Gardens at Kew. At the next meeting of the club a committee was appointed consisting of E. E. Sterns, Arthur Hollick, Thomas Hogg, H. H. Rusby, T. F. Allen, N. L. Britton, J. S. Newberry, and Addison Brown to consider the idea of establishing a garden in the City of New York. At a meeting of the club on January 8, 1889, an appeal for such a garden, prepared by the committee, was adopted and ordered printed. The text of this appeal appears in the January number of the Journal of The New York Botanical Garden for 1939. It said in part:

"The uses of a botanic garden may be reckoned as of four sorts. First and foremost is the purely scientific and educational use. Subsidiary to this, but still of a marked degree of importance, are the pharmaceutical and horticultural uses, and, lastly, the general use as a place of agreeable resort for the public at large. . . .

"To serve adequately the various uses here indicated a botanic garden requires a somewhat spacious site. The Royal Botanic Garden at Kew comprises sixty seven acres, an area ample for its purposes. Fifty acres might be considered a reasonable amount of land for a New York botanic garden; half as much could be made to answer a good purpose; seventy-five acres would be none too much for its ultimate highest development. . . .

"Two American institutions of kindred nature the Shaw Garden at St. Louis and the Arnold Arboretum of Brookline, Mass. — are already in successful operation. . . . These are modest affairs, remotely and inconspicuously situated; but a botanic garden . . . in New York City . . . would be placed at the best imaginable point. . . ."

However this may be, the fact is that within two years The New York Botanical Garden was granted a charter by the Legislature of the State of New York, and Judge Addison Brown began the campaign for funds by contributing $25,000 toward the establishment of the Garden. This sum was matched by J. P. Morgan, John D. Rockefeller, and D. O. Mills. Columbia College agreed to deposit its library on botany and horticulture and its herbarium at the Garden and contributed $25,000. With additional funds from William E. Dodge, J. A. Scrymser, William C. Schermerhorn, Charles P. Daly, Oswald Ottendorfer, Samuel Sloan, George J. Gould, Helen M. Gould, John S. Kennedy, William Rockefeller, Arnold-Constable & Co., Morris K. Jesup, Mrs. Melissa P. Dodge, Tiffany & Co., and Hugh N. Camp, the sum of $250,000 for an endowment was fully subscribed by June 1895 and 250 acres in Bronx Park for the site of the Garden were allocated by the City of New York.

It is interesting to note how the various agencies and individuals concerned during nearly a century in obtaining a botanical garden for New York City were represented in the final establishment of this institution. The Elgin Botanic Garden of 1801 was started by Dr. Hosack when he was Professor of Botany in Columbia College, and The New York Botanical Garden was initiated by Dr. Britton, also Professor of Botany in Columbia College. Thomas Hogg, son of the proprietor of the New York Botanic Garden of 1834, was a member of the Torrey Club committee which issued the famous appeal. William E. Dodge, associated

with the attempt to start a botanical garden in 1877, was one of the subscribers to the original endowment of $250,000 for this institution.

From what I have said, it is clear that two agencies were chiefly instrumental in establishing the Garden — Columbia University and the Torrey Botanical Club. The part they played was recognized in the Act of Incorporation (as passed by the New York State Legislature in 1891 and amended in 1894), which provided that the affairs of the corporation should be controlled by a Board of Managers as follows:

> The President of Columbia, the professor of botany, professor of geology, and the President of the Board of Education of the City of New York were made ex officio members of the Board of Managers and known as the Scientific Directors. The Scientific Directors managed the scientific and educational departments and appointed the Director, who appointed "his first assistant and chief gardener and was responsible for the general scientific conduct of the institution." All of the business, including the financial management, was under the control of the whole Board of Managers, which consisted of the Scientific Directors, of the Mayor, the Park Commissioner and at least nine other managers elected by members of the Corporation.

This arrangement continued until 1933, at which time the Act of Incorporation was amended by action of the State Legislature eliminating the Scientific Directors as such and placing the management of the Garden, including the appointment of the Director, under the Board as a whole. Columbia University is represented on the newly constituted Board by four managers appointed by the University and the Torrey Botanical Club by one manager appointed by the Club.

When the Garden was established it was anticipated that all the advanced work in botany at Columbia University would be given at the Garden, and when the Museum Building was built the entire top floor was given over to library, laboratories and classrooms. This arrangement to give advanced work in botany for students registered at Columbia is still in force by specific agreement with Columbia, but the distance between the other departments of the University and the Garden has interfered with the continuance of this practice in some fields of botany. We have each year several students from Columbia University (as well as students from other institutions). The herbarium and the botanical library books of Columbia are at the Garden. The Director is appointed Professor of Botany at Columbia (without remuneration), and members of the staff give courses in botany taken by advanced students at Columbia. Most of the laboratories originally used on the top floor are now devoted to other purposes (extension of the library, members' room, photographer). I mention these details to show that the relation between the Garden and Columbia is much the same as that of the several "orphan" institutions (including the Arnold Arboretum) to Harvard University, and up to 1933 was even more nearly comparable.

The Garden in its nearly 50 years has had four directors. Dr. Britton, the first Director, served until 1930 and was succeeded by Dr. E. D. Merrill, who resigned in 1935 to become Administrator of the Botanical Collections of Harvard University. Dr. Marshall A. Howe became the third Director. Upon Dr. Howe's death in 1936 Dr. H. A. Gleason served as Acting Director for a year.

The further history of the Garden I shall not attempt to detail here. Since its founding it has accumulated buildings and greenhouses, an endowment of $2,500,000, a herbarium of more than 2,000,000 specimens and a library of 50,000 bound volumes with as many or more separates. In 1940 almost 12,000 accessioned species and varieties of plants were in cultivation in the Garden, not including nearly 3,000 species and varieties comprising the collections of decorative material such as roses, dahlias, irises, peonies, asters, chrysanthemums, waterlilies, annuals, and greenhouse plants grown for floral display. Through its staff it has contributed materially to various phases of botany and horticulture and has maintained "a place of agreeable resort for the public at large." We are here today because of Columbia University, the Torrey Botanical Club, the City of New York and the many individuals who had the necessary vision and the generosity to conceive of such an institution and provide for its support.

SPECIAL CHINESE ISSUE

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by Hui-Lin Li

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Herbs In Perfumery

An Address Given April 7 at the Herb Conference at the New York Botanical Garden

By Christian Wight

ESSENTIAL oils represent herbs in a concentrated and easily handled form which facilitates their use in the host of products that are perfumed.

The term essential oils is applied in general to fragrant compounds formed in plants. Some authors consider as essential oils only the parts of the plants recovered by steam distillation. Others include in this definition compounds extracted by solvents. In either case essential oils are the mixture of volatile fragrant compounds belonging to various groups of organic classifications and found in the aromatic plants.

These essential oils are situated in cavities of the plants called "carriers" of essential oils. These cavities may include resinous compounds and often the essential oils form an emulsion through a combination with intercellular substances. In recent years it has been proved that essential oils and resins may be present in the cells of the parenchyma—the soft or succulent part of a leaf, flower, or fruit, for example. Essential oils can be found in almost any part of a plant—stems, leaves, flowers, and fruit. Sometimes they are confined to a specific anatomic portion of the plant; in other instances they may be distributed unequally in all parts of the plant. Usually the greatest amount of oil is contained in the reproductive organs such as the flowers and the fruit. Leaves and stems contain a lesser amount, while roots usually have a low content of oil, and that not in a free state but in the form of glucosides or other compounds. In such instances, in order to extract the oil, it is necessary to split the compound by fermentation.

Up to the present time there is no universally accepted theory concerning the formation of essential oils and their role in the life of plants, but there exist numerous hypotheses including protection against cold, protection from insect and fungus attack, attraction of insects to promote reproduction, as by-products in plant metabolism, and as plant hormones. If the essential oils were judged as a problem in plant biology we would find the significance of one oil no greater than any other. From the industrial point of view, however, the relative importance of the various essential oils assumes another aspect and only a comparatively small number are of primary interest.

The manufacturing processes employed to obtain the oils are three: *distillation*, *expression*, and *extraction*.

The process of *distillation* of the oil from the plant is generally performed with the aid of steam. The steam carries over the volatile bodies in the plant, and after condensation the oil and water layers are separated.

This is the method employed in isolating most of the perfume materials.

Expression of essential oils finds a limited use and is confined chiefly to the citrus oils—lemon, orange, lime, grapefruit, tangerine, and bergamot. The term means what it says, the rinds being pressed to squeeze out the oils.

Extraction is the method employed for flower oils where the cost of growing and collecting plus the low yields and susceptibility of impairment of their delicate odor make it imperative that complete recovery at low temperatures be obtained. The flowers are treated with low boiling solvents such as petroleum ether, or ether, which dissolves the odorous bodies. On removal of the solvent a flower oil is obtained.

Some Essential Oils and Their Plant Sources

To mention a few of the important plants which furnish raw materials for perfume will provide a glimpse of one phase of the perfume industry.

Lemongrass oil. This is derived chiefly from *Cymbopogon flexuosus,* both wild and cultivated in the Tinniville district of India. It has been grown in commercial quantities in many other subtropical parts of the world. The oil is obtained by steam distillation of the grass. The importance of this oil is not only for its use in perfuming inexpensive soaps and the like, but also as a source for citral, which it contains to the extent of 80%. Citral from lemongrass is widely used in both perfumery and flavor work to impart a fine lemon character. A still more extensive use is the conversion of the citral to ionones. The ionones have a soft woody violet odor, and because of their odor-strength, stability, and ease of use with other perfume materials, they play a major part in modern perfumery. The imports of lemongrass to this country alone have averaged one-half million pounds a year.

Citronella oil. Two types of this oil have large commercial use, that from Ceylon and that from Java. Both are derived by steam distillation from the grass *Cymbopogon Nardus.* The oil is widely used by itself in soaps and insecticides and is extremely important for the chemicals isolated from it. About three million pounds a year have been coming into the country. The isolates from citronella oil are geraniol and citronellal. Geraniol is a pleasant rose-like body and from it, by hydrogenation, citronellol is made which also has a rose odor. From citronellal, hydroxy citronellal is prepared. This is one of the most flowery chemicals ever synthesized and is the basis of all good lily and lilac compounds. It is often used to lend a floral character to fancy compositions.

Menthol is also prepared from citronellal. In view of the extensive use of menthol in medicine, confections, and tobacco, as well as perfumery, and the fact that Japan, the only supplier of natural menthol, is now no longer on our calling list, we are leaning heavily on menthol from citronella to fill our needs.

Geranium oils are obtained by steam distillation of the leaves and stems of a number of species of *Pelargonium* grown in India, Africa, and the Bourbon Islands. They are large-volume commodities important because of their similarity to the odor of rose flowers. Rhodinol, a chemical isolated from the geranium grown in Réunion, off the coast of South Africa, is an indispensable adjunct to compounding an artificial rose flower odor.

Clove oil is distilled from the unopened flower buds of *Caryophyllus aromaticus*. It is the odoriferous part of this common household spice. Of the 7,000 to 8,000 tons produced, large amounts go into perfumery. From clove oil we can isolate eugenol, and this eugenol can be converted into isoeugenol, both of which are the basis of carnation flower odors. Eugenol also is transformed to vanillin.

Bois de rose or ***Linaloe oil.*** This oil is distilled from the wood of *Ocotea caudata,* which grows wild in Cayenne and in Brazil. About three-quarter million pounds per year are imported. The oil itself is often used, as is its chief constitutent, linaloöl, for its fine flowery odor. When linaloöl is esterified to linalyl acetate it becomes an important ingredient in artificial lavender oils and in cologne type compounds.

These are but a few of the items produced and consumed in tonnage quantities. Others are the citrus oils (1,000,000 pounds lemon oil are produced in a year, for use in flavors and perfumery) ; the umbelliferous oils, such as anise, fennel, caraway, coriander and angelica ; the mint oils – peppermint, spearmint, and pennyroyal ; the other oils of the Labiatae, or Mint family -rosemary, sage, thyme, and lavender ; the coniferous oils - pine, fir, hemlock, and cedar ; other wood oils—sandal (1,500,000 lbs.), sassafras (1,000,000 lbs.), and camphor ; and the resins—benzoin, balsam-of-peru, tolu-balsam, and labdanum.

Perfumes Directly from Flowers

In the flower oils nature has displayed the highest degree of excellence, the greatest harmony of odor.

There are only a few flowers from which an essential oil can be successfully extracted, and these are the rose, the jasmine, the orange flower, the tuberose, the hyacinth, the violet. As an example of the labor involved in obtaining flower oils note these figures: One acre of jasmine, planted with forty thousand cuttings yields, after grafting, several hundred pounds of flowers the first year, the quantity rising to 4,000 pounds in the fourth year. This yield is maintained till the tenth year when it begins to decrease. This same 4,000 pounds of flowers yields about 6 pounds of flower "concrete" by extraction. This concrete yields about 3 pounds of absolute oil after removal of inodorous waxes. The flowers must be hand-picked in the early morning or in the evening. The most exacting care is taken of both soil and plant.

The same conditions of extreme care and tremendous handling hold true for all the other flower oils, and these highly concentrated products bring

prices of $300 up to $1500 per pound. It must be evident, from the above figures, why it is impossible to supply the demand for flower odors made with natural products—how the cost of production prohibits their use in any but the most expensive perfumes. It must also be apparent that the isolation of pure aromatic bodies from essential oils enables the perfumer to reproduce more faithfully and with greater finesse the exact note he is after.

Synthetic Perfumes from Chemicals

The completely synthetic aromatic chemicals used in perfumery should not be omitted from a comprehensive survey. They have dispossessed many natural products –as witness the tons of coumarin used instead of coumarin-bearing plants, the use of synthetic vanillin in place of vanilla, and the lost cause between wintergreen and methyl salicylate.

Perfumes, as we enjoy them in our daily life, are seldom a reflection of nature but are fantasies of the perfumer's imagination—complex blends of essential oils, aromatic chemicals and animal fixatives. They purposely dodge identification and include such a range of notes that practically anyone who catches the aroma is pleased by some part of it. This blending of essential oils and their products is the perfumer's job and it is he who has given you the lilac, gardenia, honeysuckle, carnation and the host of other odors used in the many colognes and toilet preparations.

The sense of smell is, sadly enough, a little used one. Many people have sharp noses, but if untrained, can only place odors into a few classifications such as sweet, sour, or pungent, spicy, fruity, and flowery. Many can only distinguish between a good odor and a bad one, and some not even that.

The Uses of Fragrant Odors

There are some seventy industries directly and indirectly dependent on perfume materials, and probably 80% of the perfume materials are based on herbs and other botanical sources. There is not one of us who is totally unaware of the part perfumes play in our daily life, but few realize how we come in contact with them from the time we get up till the time we retire. Soap alone consumes several million pounds of perfume yearly. We use perfume in creams, lotions, powders, brilliantines, bath salts, shampoo, shaving preparations, and lipsticks, as well as toilet water and handkerchief perfumes. We use it to enhance a thousand products such as paint, moth crystals, textiles, tooth paste, tobacco, floor wax, cleaning fluids—in fact, the uses range from perfuming the fountains at the World's Fair to improving the odor of a chicken coop on a hot summer's day.

Our taste has been developed to appreciate perfume as a means of beautifying our suroundings, and though war has cut off many of our supplies and defense has cut off many of our chemicals, we will find a way to continue our battle against unpleasant odors.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Landscape Architecture

CONTOURSCAPING. Ralph Rodney Root. 140 pages, illustrated, indexed. Ralph Fletcher Seymour, Chicago, 1941. $10

CONTOURSCAPING is presumably a book for the professional landscape architect or landscape student. However, the professional of proper training and ability is already thoroughly familiar with the principles of landscaping which the book discusses, and the student can find them more clearly and simply stated in many other places. There is no question of Mr. Root's own understanding and practical application of the finest kind of landscape design, but his analysis and explanation of its principles is confused by intricate and unfamiliar terms, inadequately defined and poorly exemplified. The reader is left little the wiser, even after a painstaking reading, and richer only by a few tricky phrases of doubtful meaning. The cover jacket states that Mr. Root has not written a book since his early one of 1914, and it is regrettable that he did not give us the benefit of his rich experience of these twenty-seven years in the clear and direct language of the earlier volume.

MARY DEPUTY LAMSON.

"S.P.N."

STANDARDIZED PLANT NAMES, Second Edition. Edited by Harlan P. Kelsey and William A. Dayton for American Joint Committee on Horticultural Nomenclature. J. Horace McFarland Company, Harrisburg, Pa. 675 pages. 1942. $10.

A volume of the second edition of Standardized Plant Names ("S.P.N.") is of primary value and interest in regard (1) to the standardization of names and (2) to the "innovations" in the nomenclature, the most important of which recognize the distinctions between (a) true species, (b) groups of hybrids (named "polybrids") and (c) clones.

In recognizing the clone and the polybrid the Editorial Committee of Standardized Plant Names renders a somewhat belated service to both botany and horticulture. In the first edition these distinctions were not made. That the rules of botanical nomenclature adopted to present date are inadequate in application to cultivated plants has been noted in various publications and also in the deliberations and recommendations of the International Committee for Horticultural Nomenclature.

In any list of species names which is without either descriptions or citation of authorities, the identity of the group of plants to which any name applies is not indicated. Hence the person who consults a volume of S.P.N. in regard to any name must either have a knowledge of what that name applies to or be able to obtain this information from other sources.

In the designation of clones and of polybrids in S.P.N. there are numerous inaccuracies. Especially are many definitely recognized clones listed as polybrids or even as species; but in most cases this treatment follows that of some manual.

The Editorial Committee of S.P.N. recommends that there be "one standard common name for each plant." In reference to the names of species and true varieties the term "plant" really refers to a group of individuals of successive seed-grown generations. When two or more common names are in use for a group of plants only one is approved. Numerous new common names have been improvised. Numerous double names and hyphenated names in common use have been reduced to a single word, such as Lilyofthevalley, Jerusalemartichoke, etc.

There is much information concerning plants available in a volume of S.P.N. For any genus of plants one may learn how many species, varieties, polybrids, and clones are listed as important to man. For numerous genera the horticultural clones are segregated and listed by common names and the names of the originators are given (see *Aster*, *Begonia*, *Azalea*, *Hemerocallis*, etc.). There is a

list of plant patents with an index of the plants involved. Lists are given of poisonous plants, range plants, state flowers and trees, fiber plants, herb garden plants, and other groups of plants that have special interest. These lists are useful as a basis for obtaining specific information in descriptive literature.

Criticism of this volume is to some degree tempered when one reads the following statements in the preface: "Standardized Plant Names adopts the rule that species and natural varieties only are entitled to Latin or botanical names and that all hybrids, clones, polybrids, horticultural varieties and the like should receive suitable English or common names. . . Time and other serious handicaps make it impossible for the Editors to consistently carry out these principles. Yet reasonable progress has been made and it is hoped a later edition may see all necessary changes made in conformity with this beginning."

A. B. STOUT.

Reference Work on Lumbering

COMMERCIAL TIMBERS OF THE UNITED STATES. H. P. Brown & A. J. Panshin. 554 pages, illustrated, indexed. McGraw-Hill Book Co., New York, 1940. $5

Though the title is somewhat misleading, suggesting as it does a practical handbook, this volume is definitely a contribution to its field as a concise and comprehensive text and reference work. It should be extremely helpful to engineers and other technicians who normally possess little technical knowledge of lumber, a material which is rapidly regaining its lost markets and earning added prestige as a substitute for some of the more strategic and less plentiful construction materials.

There is an excellent botanical background concerning the growth of plants and trees. This in itself is ample justification for the book at this particular time when many of the "fire-side foresters" are attempting to bring about legislation for public regulation of private forests and who are basing their propaganda principally on the erroneous assumption that trees should be saved because they cannot be replaced.

The diagrammatic sketches and photographs with which the text proper is so amply illustrated are especially well done, as they are both pleasing and practical.

The descriptions of the commercial species of lumber are clear and informative. The keys for identification are no doubt quite correct technically, but naturally their application is normally restricted to the classroom or laboratory.

All in all, Commercial Timbers of the United States is an excellent technical treatise combining a lot of valuable information that would be quite difficult to secure piecemeal from other publications.

R. E. BRODERICK,
Northeastern Lumber Manufacturers Association, Inc.

Chemistry in Botany

CHROMATOGRAPHIC ADSORPTION ANALYSIS. Harold H. Strain. 222 pages, illustrated, indexed. Interscience Publishing Co., New York, 1941. $3.75.

This is the only American book on chromatographic adsorption, a technique invented by Tswett in 1906 for separating the leaf pigments. Chromatographic methods are useful in separating closely related compounds for analytical or preparative purposes, or in preparing a compound in a high state of purity. A valuable part of the book is the discussion of adsorbents and eluants. About one-half of the book is devoted to the chromatography of organic compounds. The author's experience with the methods has been considerable and has enabled him to write a brief and useful book.

F. W. KAVANAGH.

Current Literature At a Glance*

Sargentia. Named in honor of Charles Sprague Sargent, the first Director of the Arnold Arboretum, *Sargentia* made its initial appearance on July 20. This new periodical is a continuation of the *Contributions from the Arnold Arboretum* (1932-38). It is planned to publish *Sargentia* at irregular intervals for the presentation of longer papers in various fields

* All publications mentioned here—and many others—may be found in the Library of The Botanical Garden, in the Museum Building.

of botany. The first number contains a foreword by E. D. Merrill and a treatment (148 pages) by A. C. Smith and several collaborators of the Fijian plants collected on the 1940-41 Pacific cruise of the *Cheng Ho,* sponsored by Mrs. Anne Archbold. In this paper 91 new species and several varieties are described and several genera are treated in detail for the region. The second number, a study of the Chinese Araliaceae by Hui-Lin Li, will be distributed in September and October.

Peanuts as a War Crop. The demand for 5,000,000 acres of peanuts, in place of the former 1,900,000, in order to provide additional oils for wartime use, has led to the publication of a circular (No. 135) by the Georgia Experiment Station which can serve as a manual for the culture and marketing of peanuts. It contains tables for the probable monetary returns and suggestions for maintaining the soil fertility in the face of an increased output from the acreage. The peanut oil is to be used for soaps, pharmaceuticals, glycerine, lubricants, putty, and paint, as well as for vegetable shortening and oleomargarine. This extensive use of peanuts has been built up since 1934.

Notes, News, and Comment

Volunteer. Kathryn S. Taylor, coauthor, with Edith W. Gregg, of "Winter Flowers in the Sun-heated Pit," published last year by Scribner's, came to the New York Botanical Garden August 4 to work for a short period as a volunteer in the horticultural department.. Mrs. Taylor is an instructor at Lowthorpe School of Landscape Architecture.

Visitors. Dr. John Shuman, who was a scholarship student in plant breeding during 1936, visited the Garden in July just before leaving for Guatemala to undertake the work of breeding *Cinchona* for a higher yield of quinine.

Dr. E. J. Schreiner also came to the Garden last month to consult with Dr. A. B. Stout on his work in forest tree genetics for the U. S. Forest Service, a project in which Dr. Stout is a collaborator.

Elmer A. Claar of Chicago, chairman of the daylily committee of the American Amaryllis Society, spent a day at the Garden last month taking kodachromes of some of Dr. Stout's new selections.

Dr. N. Ingram Hendey of the British Museum of Natural History inspected the Garden's collection of diatoms July 25. Other recent visitors in the mycological herbarium have included J. E. Nielsen, President of the State Microscopical Society of Illinois; Dr. Walter J. Nickerson of Wheaton College; Rolf Singer of Harvard; and B. H. Davis of Rutgers.

Richard A. Howard of the Gray Herbarium at Harvard came to the Garden early in August to work for several days on the flora of Cuba. Antoinette Miele of Cornell visited the herbarium earlier in the summer investigating species of *Aralia* and *Cornus.* Among other visitors have been Dr. Carl LaRue of the University of Michigan; Dr. J. B. S. Norton of the University of Maryland; Mrs. B. B. Hillary, University of Toronto; Charles Breitenbach, a student from the University of Wisconsin; Dr. Wanda K. Farr, American Cyanamid Co.; Elbert L. Little, U. S. Forest Service; Dr. Cynthia Westcott, Glen Ridge, N. J.; and Camilla Bradley, editor of *Home Gardening* magazine in New Orleans.

To Rochester. Dr. F. W. Kavanagh is leaving the Garden this month to teach at the University of Rochester, where for the current school year he is replacing Dr. David Goddard, on leave of absence to work on a Guggenheim fellowship. Mrs. Virgene Kavanagh will continue, while in Rochester, some research on vitamins and plant growth which she has begun in Dr. Robbins' laboratory at the Botanical Garden.

New Laboratory. At the Connecticut Agricultural Experiment Station at New Haven, a new building for the departments of entomology and genetics has recently been named the Britton Laboratory, in honor of Dr. Wilton Everett Britton, who was State Entomologist for forty years until his death in 1939. This Dr. Britton was not, so far as is known, related to Dr. N. L. Britton of the New York Botanical Garden

THE NEW YORK BOT

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Pkwy., or, coming from Westchester, turn we

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner in plant identification. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 figures, covering algae, fungi, mosses, ferns, flowering plants. 1918. $3.50

A Text-Book of General Lichenology, by Albert Schneider. 230 pages. 76 plates. 1897. $2.50.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50; unbound $15.50.

Keys to the North American Species of Carex by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora.* $1.25.

Plants of the Holy Scriptures by Eleanor King, illustrated, and accompanied by a list of Plants of the Bible with quotations, in the March 1941 Journal. 15 cents.

Food and Drug Plants of the North American Indian. Two illustrated articles by Marion A. & G. L. Wittrock in the Journal for March 1942. 15 cents.

Hardy Ferns and Their Culture. Edited by Carol H. Woodward. 40 pages, illustrated: bound in paper. 1940 25 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward. 28 pages, illustrated with photographs and drawings; bound with paper. 1941. 25 cents.

Vegetables and Fruits for the Home Garden. Four authoritative articles reprinted from the Journal. 21 pages, illustrated. Edited by Carol H. Woodward. 1941. 25 cents.

An Herbal. First published by Richard Banckes in London. 1525. Edited and transcribed into modern English with an introduction by Sanford V. Larkey, M.D., and Thomas Pyles. 200 pages, including facsimile of original. Prepared by Scholars' Facsimiles and Reprints. 1941. Price to members of the Garden, $2.50; to others, $3.50.

Succulent Plants of New and Old World Deserts by E. J. Alexander. 64 pages, indexed. 350 species treated, 100 illustrated. Bound in paper. 1942. 50 cents.

Periodicals

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Memoirs of The New York Botanical Garden. A collection of scientific papers. Contents and prices on request.

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CAROL H. WOODWARD, Editor

AMERICA'S HORTICULTURAL DEBT TO CHINA

IT would be strange to picture an American suburban scene without a gleaming shower of forsythia in spring, without China asters, tiger lilies, and a row of hollyhocks abloom beside nearly every house. The landscape would scarcely seem genuinely American without these plants—yet all of them have come from China.

Many of the daylilies being used for breeding handsome new hybrids once grew on the mountainsides of China. Chrysanthemums that are bought from the florist in the fall were derived from a remote Chinese ancestor The weeping willow is one of China's most ancient gifts to the West.

In the big city the ginkgo and tree-of-heaven (*Ailanthus*) are constant reminders of this country's horticultural debt to that eastern nation that is now its ally, for these sturdy Chinese trees are found to thrive better amid pavements than any of the native kinds.

Some of the deutzias and weigelas—shrubs with awkward names but with a springtime flush of bloom that endears them to nearly every man or woman with a plot of ground—were found in the wild in China and introduced within the memory of present-day gardeners. The beauty-bush, *Kolkwitzia amabilis*, was discovered in China only forty years ago and first brought into American gardens only about two decades back. Explorers like Farrer, Forrest, Kingdon-Ward, Henry, and Wilson have in the last half century enriched American gardens with primulas, lilies, rhododendrons, viburnums, barberries, buddleias, cotoneasters, magnolias, and other ornamental plants which have approximately doubled the number of species of these that were grown in this country prior to their explorations. In the nineteenth century Robert Fortune made comparable discoveries

While these men and others traveled over much of Asia, it is largely in China that they found the choicest garden plants for America, and these have come to take their place effectively beside the familiar hollyhock, aster, and forsythia.

Hui-lan Koo

MME. V K WELLINGTON KOO.

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Bamboo and Chinese Civilization

By Hui-Lin Li
Arnold Arboretum
Of Harvard University

CHINA is indebted to the bamboo plant for the most ancient and most clearly recorded history in the Orient. Yet the fact that Chinese civilization, particularly in its embryonic stages, has been inseparable from the use of bamboo is scarcely realized by Occidentals who are unfamiliar with the plant.

Even today bamboo is of direct concern to the Chinese people. It is the country's most important "timber tree"* and it provides the chief material for shelter by the peasants in South China. Roof, walls, poles, window-frames, shutters, curtains, doors, fences, and many other parts of a house and its surroundings may be made of bamboo culms or strips. Most of the farm implements too are fashioned either partly or wholly from this all-purpose plant. Household articles of bamboo such as chairs, stools, beds, cases, ladders, crates and boxes are too numerous to be mentioned. Bamboo may also be made into kitchen utensils, chop-sticks, mats, baskets and other sorts of containers, and endless varieties of ornaments and fancy articles.

In addition, bamboo furnishes the people with such means of transportation and communication as rafts and bridges and parts of boats. The

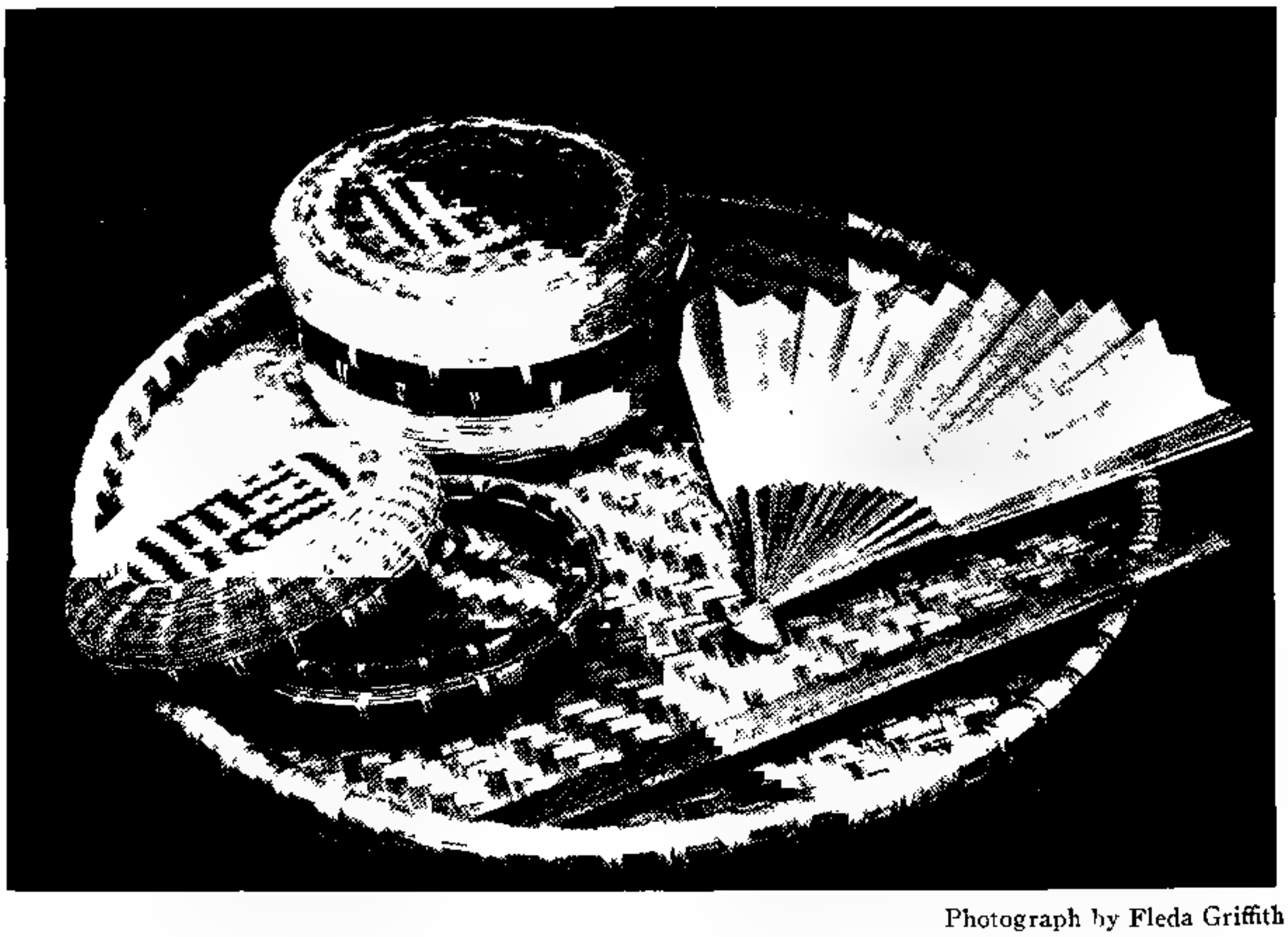
* Bamboos are actually grasses, not trees. They constitute the subfamily Bambusoides of the Grass family, the Gramineae. Of approximately 200 different species, more than three-fourths are scattered over Asia, with southeastern Asia the chief center of distribution. In China, bamboos are found abundantly along the Yangtse valley and in all provinces south of it, but sparingly in the North along the Yellow River. However, it seems from records which are frequently found in the ancient classics, that bamboos were once quite common along the Yellow River, which is the cradle of Chinese civilization. The ancestors of the present Chinese people, moving eastward from the Central Asia Plateau and finally settling down in the Central China Plain, apparently soon became acquainted with this remarkable, valuable plant and utilized it marvelously for maintaining the living of the people and the preservation of the race.

primitive type of travel by means of sedan-chair has been made possible only by the presence of light-weight but strong bamboo. Paper and musical instruments are made from the plant, and the young shoots are eaten as a vegetable.

In fact, it is impossible to enumerate all the bamboo products in a paper of this length. Of greatest fundamental significance are the historic uses of the plant, through which it has influenced the civilization of China.

Chinese Characters and Early Written Records

According to legendary history, Ts'iang Chi invented the Chinese characters by imitating the foot-tracks of birds and mammals. While known ancient records were put on bamboo blocks, CHU CHIEN, which might be combined together to form books, called T'SE, apparently the first practice must have been to carve on living culms of bamboo with stone, metal, or other pointed materials. This custom probably influenced the form of the Chinese characters, which have changed gradually and considerably in shape up to the present form, for strokes imposed on living bamboo will gradually shape themselves into forms very similar to the CHUAN types as years pass by. Persons who have had experience in



Photograph by Fleda Griffith

BAMBOO IN MODERN CHINESE ARTICLES

Baskets, a tray, a fan, and a ruler, its ten divisions marked off with small brass studs. All these objects were obtained in New York's Chinatown.

carving their names on bamboo culms at scenic spots may well prove this fact. The CHUAN types were devised by T'ai Shih Chou and Li Szu, who founded the great CHUAN and little CHUAN.

Eventually, silk and linen cloths replaced the bamboo blocks which had been extensively used for taking records. In still later years both bamboo blocks and cloth were entirely replaced by paper. But for several thousand years before the invention of paper, these bamboo blocks were entrusted with the preservation of all ancient records. It is for this reason that China is indebted to bamboo for a clearly recorded history of ancient lineage. Bamboo tablets known as HU (later replaced by jade, wood, or other materials) were used in the emperor's official circles in ancient times. The primary purpose was to take down any necessary notes or memoranda on the tablets. FU or bamboo blocks in two halves were used as tallies for an officer's commission or as seals in conferring military powers. Bamboo slips, TS'IEN, were used exclusively for labels of all sorts and for drawing lots for divining.

The invention of paper is generally accredited to T'sai Lun of the Han Dynasty, more than 2,000 years ago. Reliable records, however, have not been found, and the actual existence of paper is ascertained to be at a later date. So far as known by people of later days, T'sai Lun made paper out of rags and fishing nets. But one wonders if bamboo may not have first been used, as it has been the most extensively employed material for the manufacture of paper in all ages. The inner white papery layer of the culm, which is frequently used for sealing the second hole of the flute, might have been the first suggestion of paper. As a matter of fact, it is the closest natural product to the Chinese bamboo paper.

Music, Law, and the Calendar

Chinese music apparently owes its origin to the manipulation of bamboo. There are records pointing toward the founding of the art by Ling Lun at the order of the first emperor, Huang Ti, who used twelve bamboo tubes of different lengths to determine the twelve notes or LU. As a matter of fact, nearly all the earlier musical instruments were made of bamboo, a few of which, such as different forms of flutes, are still in existence.

Ancient Chinese sages and politicians strongly emphasized music and looked upon it as the fundamental prerequisite of governing the people and ruling the state. That law came out of music is evident, since it has the same character as the musical note, LU. That the calendar also owes its origin, at least in part, to music is not so obvious to the modern mind, but the relationship can be easily shown. In the ancient records music, law, and the calendar were closely associated, for, according to the sages, they were all expressions of ryhthm.

The development of the calendar was to a certain extent effected through

Photographs from the Metropolitan Museum of Art

CHINESE MUSICAL INSTRUMENTS OF BAMBOO

A transverse flute (TI-TZU) *tipped with ivory is shown at the left. At the right is a mouth-organ* (CHENG *or* SHENG), *fitted with a crook mouthpiece and 17 bamboo pipes of varying lengths. Thirteen of these pipes are fitted with free reeds and each has a small hole just above the point where it enters the reservoir. In blowing into this instrument, no sound is produced unless the holes are covered. The* CHENG *dates from time immemorial in China, and is interesting as embodying the principle of the free reed, more fully developed in the grand organ of today*

the use of bamboo musical tubes. As the Chinese use the lunar calendar, the solar periods will not come on the same lunar dates every year; therefore they have to be determined otherwise. The different solar periods, known as TSIEH, (joints) or CHI, (air) are of great importance in the Chinese calendar, as the farmers follow them closely for their activities, and China is primarily an agricultural country. So in ancient times, to determine a given solar period, the ash of certain grasses was placed in a number of bamboo musical tubes which represented the different solar dates. When the proper time arrived, the ash was said to fly out from one of the tubes, and this phenomenon determined the exact time of the solar year. If the ash really behaved thus because of a change in the weather or in atmospheric pressure, this early bamboo instrument might be called a crude barometer. By this strange token the ancient Chinese farmer was expected to plant his crops.

Moreover, the record of date, and later also the year, month and hour, were made by the KAN-CHIH or stem-branch system. There are ten KAN, and twelve CHIH, which are arranged to give sixty combinations. The stem and branch were developed out of that of the trees, and although there was no record pointing particularly toward bamboo, nevertheless, it is in this plant that the main stem and side branches are most readily recognizable.

Mathematics and Measurements

Bamboo is responsible for the beginnings of mathematics. The earliest form of arithmetic was calculating by means of bamboo billets, CH'OU. They were also used for computing numbers as counters in archery or other games. Bamboo is also responsible for providing numerous amusements for the Chinese people. Many of these have gradually become means of gambling. The character for gambling, PE, was originally written with the sign of bamboo at its top, in recognition of its relation to bamboo. The first material for making chess-men, cards, dice, and many other games was bamboo.

The unit of measurement, the Chinese foot or CH'IH, was derived from the bamboo blocks for written records, as the latter was frequently known as CH'IH CHIEH or CH'IH TU. The length of the block equaled one CH'IH, and it was also the average length between the nodes of a bamboo culm. The block had to be made from the internodal part to avoid the joints and it eventually led to its use as unit of measurement also. Up to the present, bamboo strips are still used throughout the Orient as rulers.

Weapons and Gunpowder

The earliest Chinese people demonstrated their warring ability and succeeded in conquering by wars many aborigines in their part of the continent and thus made possible the establishment of the great Chinese

Empire. The most primitive weapons used in battles, such as lances, bows, arrows, so far as records go, were largely made from bamboo. It was not until later years that wood and metal were used. But still bamboo was

Photograph from the Metropolitan Museum of Art

BAMBOO IN EARLY CHINESE ART

Wind in Bamboo is the style of this early Ming dynasty painting [1368-1644] done in the style of Wen Tung of the eleventh century. Another Ming dynasty painting called "Classic Gem" is shown on the opposite page. It depicts bamboo in an open garden

indispensable in the manufacture of other war equipment, especially arrows.

Many other articles used in warfare and made from bamboo were developed gradually with the advance of civilization. The most prominent of these were long ladders used in offensive warfare and pointed posts for defense. Mencius, the great sage of 372—289 B.C., recorded that his contemporary Kung Shu Tsu once made a T'SIE out of bamboo and sent it flying for three days without its coming down. One wonders if it is justified to call it the first successful model of an airplane in all history.

The invention of gunpowder is regarded as one of the greatest contributions of the Chinese people to what is called the "civilization" of the world. Besides employing it in warfare, the Chinese have used it even more extensively in making firecrackers.

An interesting problem is presented here as to the origin of these two. Firecrackers are used universally in China at present because of belief in their power to avoid bad luck. They were evolved out of bamboo, as the name PAO CHU or "cracking bamboo" indicates. In ancient times, people used to set fire in the night near bamboo groves and the heat would increase considerably the volume of the air in the hollow internodes of the culms, causing them to explode with a loud sound which frightened away wild beasts, as well as the ghosts and spirits believed in by the primitive people. In fact, this custom still prevailed in the wilderness up to times not long ago, and Marco Polo described a similar custom of travelers.

In later years explosives were placed in bamboo tubes, thus rendering them more easily accessible at all places. Still later, wrappings of paper were used to substitute for the bamboo tubes, and this resulted in the present form of firecrackers. It is still problematical as to whether gunpowder was really developed out of the use of firecrackers, although it seems quite reasonable that the two were closely related at the beginning. It may be of significance that from certain large-sized bamboo, charcoal is manufactured in West China—and charcoal is an essential ingredient in gunpowder.

Agriculture and Other Essential Industries

Most of the Chinese farm implements (too numerous to be mentioned) are made of bamboo. Evidently, many of those in use today are still in the same patterns that were used 5,000 or more years ago. The farmers are thus not only sheltered by houses, dressed by raincoats and hats, and provided with furniture and household articles all made from bamboo, but are also fed by farm crops which have been planted, harvested, and prepared by the employment of bamboo implements. Besides those used in the fields, all other instruments for harvesting, milling, and storing grains, such as sieves, winnowing fans, baskets, and storage containers, are largely or completely made of bamboo.

Silk was the most important textile fiber used in ancient times, and the

Photograph by Mrs. Fred B. Noble

BAMBOO IN FRUIT

The phenomenon of a grove of bamboo in fruit, then dying, was witnessed in Jacksonville this past summer. In times of famine, the grains of the bamboo, which are developed only after many years of growth, have more than once saved the lives of people in China, where the plant is abundant.

silk industry depends a great deal on bamboo. The flat pan for rearing the worms and the baskets for collecting and delivering leaves of mulberry tree are all woven of bamboo. Spinning and weaving machines are also the products of the same plant.

The fishery industry would also be practically rendered impossible without the presence of bamboo, as all instruments for collecting and rearing fishes are made from this plant, which is very durable in contact with the water and is easily manipulated. Primitive hunting, by means of arrows, lances, and similar weapons, again depends largely on bamboo. In the Southwest, snares made of bamboo for trapping tigers and other wild beasts are still widely employed by the natives.

The importance of cereals as the chief foodstuff for man has made them closely related to religious ceremonies in ancient times. Most of the containers holding cereals when offered for sacrifice were, according to the records, made of bamboo, a fact which indicates the intimate relationship between the two types of plant in the very earliest days. Bamboo has even been used as a cereal itself in times of emergency. Its grains are scarce because bamboo will grow for many years without fruiting,*‡ but occasionally they are produced in large quantities, almost miraculously, it would seem, in times of need. Since they are edible, they have contributed uniquely to the preservation of the Chinese race not a few times in its history during famine years.

What Future Research May Show

This brief review of some of the outstanding contributions of bamboo should be sufficient to indicate its significance in the Chinese civilization. It becomes evident that this one type of plant is responsible for many of the characteristics that differentiate the civilization of China from that of the West. Nowhere in the world is bamboo so abundantly present and readily available as eastern Asia where China is located. The ancient

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* Unlike the smaller grasses, which usually live for only a year or two, the bamboos live for 20 to 40 years. Shortly before the end of the life of a plant, it will flower and fruit, then die. As a clump or an entire grove of bamboo is often a single plant, the numerous culms or upright branches of which are connected by the underground rhizome, the sudden flowering, fruiting, and dying of an entire clump present a strange phenomenom which is given much attention, especially when the plant happens to fruit at a time when other grains are scarce.

‡ It is not only in China that the fruiting of bamboo arouses excitement. A recent letter to the editor from Mrs. Fred B. Noble of Jacksonville, Fla., says in part: "Early in the summer a friend telephoned me to come across the river to see the queer behavior of the bamboo. The green leaves had fallen and the tops of the reeds had turned dry and stubbly, and were forming heads like wheat or rye, without beards but with dangling pollen. All through the summer the bamboo has seemed to be dying although continuing the effort to seed. Whether it seeds because it is dying or dies because it is seeding is a mystery. The nodes seem to be leaking life juices which draw ants Birds are plentiful around the plants." It was from this bamboo that the photograph on page 221 was made.

Chinese, by virtue of their superior intelligence in comparison with the aborigines, and their constructive talent, developed their ability in manipulating this wonderful plant in multitudinous ways until they gradually shaped out their great civilization in that corner of the earth.

The writer does not mean to go so far as to say that bamboo solely is responsible for Chinese civilization. Many other things have played important roles, too. But it is to be pointed out that bamboo has occupied a unique and prominent part at least in a certain period. More extensive studies in classics and archaeology will surely enlighten this problem. As bamboo is not so easily preserved as metal, stone, and earthenware, our attempts at archaeological research will not be so fruitful as that from other records. Nevertheless, this apparently overlooked portion of knowledge is worthy of receiving more attentive study by historians, archaeologists, anthropologists, and biologists as well.

China's Contribution in Medicinal Herbs

*By Willard M. Porterfield, Jr.**

KNOWLEDGE of medicinal plants in China goes back to legendary times before the day of the written word. The combined lore of agriculture and medicine was the earliest phase of plant science to occupy the minds of wise men, and its facts and practices for many centuries were passed along by word of mouth. The first treatise on medicinal plants, it is said, was compiled by the emperor Shen-nung, the father of agriculture and medicine, who reigned about 2700 B.C. It is known as the Shen Nung Pen Ts'ao King, or Classical Herbal of Shen-nung, and is usually referred to as the Pen-king. Exactly when it was set down in characters is not known, but the general supposition is that it was published in the Han period (B.C. 202—A.D. 221). This small work not only is the most ancient document of Chinese *materia medica*, but also the foundation of all the later works on the subject. It treats of 365 different drugs, one for each day of the year.

Most of our information on these drugs of the Pen-king comes from quotations found in the Pen Ts'ao Kang Mu, the famous *materia medica*

* Dr. Porterfield, who is now with the Soil Conservation Service of the United States Department of Agriculture, spent many years as a botanist in China. He is the author of a series of articles on Chinese Vegetable Foods in New York of which eleven have appeared in this Journal and more are promised. The article presented here has been adapted from the address he gave last April 7 during the Garden's two-day conference on herbs and medicinal plants.

published in the second half of the 16th century by Li Shi-chen, who is considered the greatest critical writer of the past on the natural history of China. The index of the Pen-ts'ao lists 252 of the vegetable drugs of the Pen-king, and about 239 of them were derived from indigenous plants growing wild.

Today, some of the same plants which were apparently used 2,000—even 5,000—years ago in China, when analyzed and tested by twentieth century methods, are found to have unsuspected possibilities for modern medicine. Yet their early use was accompanied by beliefs which were based on fancy and superstition rather than on scientific principles. Because the imagined virtues of plants were suggested by their more obvious properties the so-called "doctrine of signatures" arose and external characteristics became the criteria of suitability for a particular ailment. A few quotations will suffice to illustrate:

> "All medicines that are sweet belong to the element earth and affect the stomach; all medicines that are bitter belong to the element fire, which enters the heart."
>
> "All medicines, on account of their properties, that are cold, hot, warm, and cool, belong to the *yang,* or male energy in nature, while their tastes, as sour, bitter, sweet, acid, and salt, belong to the *yin,* or female energy."
>
> "The upper and lower, the internal and the external parts of medicinal plants have each their correspondent effects on the human system. The peel or bark has influence over the flesh and skin; the heart (pith) operates on the viscera, etc. The upper half of the roots of medicinal plants has the properties of ascending the system, while the lower half has that of descending."

One of the outstanding examples of a plant which has been glorified far beyond its real value as a medicine is ginseng. The Chinese have had the most extravagant ideas about the virtue of ginseng root, chiefly because in shape it sometimes resembles the figure of a man. Cases are described in which sick people who were practically dead have, upon administration of ginseng, been sufficiently restored to transact final items of business. However, the extraordinary medicinal qualities ascribed to ginseng have their basis in the imagination of the people. The root is actually little more than a demulcent and today in America it is rarely used as a curative.

A student wishing to study the genuine medicinal plants of China today would receive very little help from a modern American text-book of pharmacognosy, for, though many exist, very few are included. India, Ceylon, Java, occasionally Japan, and the Middle East are mentioned as sources, but authors seem almost deliberately to avoid citing the medicinal plants of China.

This seems strange in view of the fact that Bernard E. Read, one of

our foremost students of Chinese medicinal plants, has listed 898 plants in his compilation entitled "Chinese Medicinal Plants from the Pen Ts'ao Kang Mu."[1] Not only that, but he and his Chinese associates have substantiated in many cases claims made for them by tradition. Before him G. A. Stuart,[2] an earlier student of medicinal plants of China, gave accounts of 731 plants of which 107 are listed in the United States Pharmacopoeia and National Formulary, and are in general use in the United States.

Significant in this connection are import figures for drugs coming from China. In 1938 of the total crude drugs imported, those coming from China constituted only about 9 percent. This may partially explain the little space devoted in textbooks to Chinese drugs and drug plants. Because of distance or disturbed conditions, if a suitable alternative is available nearer at hand in the form of a related species, that form will be the one to be exploited. Only those drugs, in other words, are imported from China which cannot be obtained elsewhere, as in the case of Chinese ephedra. Notwithstanding, we strongly feel that an adequate coverage of medicinal plants can be obtained only if the Chinese plants and their uses are given more serious consideration.

Four Groups To Be Considered

Chinese medicinal plants naturally fall into four groups: (1) Plants which possess chiefly imagined virtues, such as ginseng. (2) Plants which have certain medicinal properties but not in sufficient amount to bring them within the scope of commerce. (3) Plants with outstanding medicinal properties, which are an important staple in the export trade of China. (4) Plants which are eliminated from the category of trade items either because related species in other lands furnish an equally good source of the drug or because they have been introduced and successfully cultivated in other lands. The second and last are the largest, if not the most important classes. The first class needs no further discussion here.

An example of the second class is the Chinese lotus, *Nelumbium speciosum,* well known as an ornamental and food plant. Though it is not recognized in the United States Pharmacopoeia, its medicinal virtues have been highly praised in classical Chinese literature and it is still being used by Chinese doctors for a number of strength-giving purposes.

The kudzu root (*Pueraria Thunbergiana*), besides being a source of starch and textile fibers, is said to be antifebrile, anti-emetic and counter-poisonous. Decoctions from the root take care of colds, fevers, influenza, dysentery, snake and insect bites, and serve as an antidote for poisonous drugs such as croton oil. *Luffa cylindrica,* the dishcloth gourd, commercially grown for its fibrous spongelike skeleton and for its food value when immature, is also considered a valuable medicinal plant in China.

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[1] 3rd edition, 1936.
[2] Chinese Materia Medica. 1928.

Chinese Drugs Used The World Over

The third group of plants is by far the most important from the standpoint of both China's trade and that of the world. Here we have included not only those outstanding Chinese medicinal plants which have obtained world recognition, but also some of those which have been shown by test to be worthy of induction into medical practice and therefore worthy of serious consideration for commercial exploitation.

From the Chinese herb known as MA-HUANG, ephedrine, an alkaloid, is derived. The crude drug has been known to the Chinese for fifty centuries as a diaphoretic, antipyretic, circulatory stimulant and respiratory sedative. The best grade of MA-HUANG assays 1.5 to 2 percent of total alkaloids,[3] but a seasonable variation has been noted, Read and Liu showing that the alkaloidal content is greatest just before the frost comes. Reaction to weather, season, or environment is probably one reason why *Ephedra sinica* when cultivated in the United States gives a low yield.

According to J. C. Liu, Chinese ephedrine comes from three sources, but MA-HUANG comes definitely from the plant described by him as *Ephedra Ma-huang*. The other two ephedras are from North China and Mongolia, *E. sinica* and *E. equisetina*. Some species grown in southern Europe contain ephedrine, but the American species contains none. Unfortunately the importation of ephedra from China has steadily decreased from 1,948,011 pounds in 1935 to 1939 when it amounted to only 614,275 pounds.

Rhubarb is another medicinal product of China which has long been a regular import into the United States. Chinese rhubarb is obtained from *Rheum palmatum* and *R. officinale* growing in Szechuan, Shensi, Hupeh and Kansu provinces. Since the days of the Five Rulers (3000 B.C.) rhubarb has been used as a drug, though before then it was thought to be poisonous. The plant known as Chinese, Canton or East India rhubarb reached Europe originally by caravan via Russia and Turkey but later directly by boat from China. Marco Polo recognized it on his travels through Kansu. Today, centuries later, its status is still one of universal esteem. The Shensi type is now preferred in medicine.

The star-anise (*Illicium verum*), little known in the United States, is used throughout the Orient for its flavor and in China also as a medicine. The seeds and pericarp yield a highly aromatic oil which gives the scent of anise to liqueurs and perfumery, while as a medicine it acts as a carminative, diuretic, expectorant, and stimulant. The tree from which the fruits are gathered grows wild in Kwangsi, Kwantung, and Yunnan. In commerce it is sometimes confused with *Illicium anisatum*, the bastard star-anise, whose seeds have a balsam odor and secrete a poisonous substance

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[3] Chen, K. K. Ephedrine and Ma-Huang. The Chemist and Druggist. **129**:585-587. Nov 26, 1938.

called sikimine. Though there are definite ways of distinguishing the two, some of these fruits occasionally creep in with the others, and cases of poisoning have been treated even as far west as France and Holland.

Camphor has been made in China since the earliest record and Marco Polo saw the trees which produced it. In the earliest poems of the Arabic language it was mentioned and by oriental nations it was considered a rare and precious perfume along with musk, ambergris, and sandalwood. As a medicine, it is perhaps better known in the Occident than in the Orient. *Cinnamomum Camphora,* while growing in China, however, has been exploited by the Japanese in Formosa and in Japan, which have become the greatest producers. Natural camphor has yielded more recently in some degree to a synthetic product which up to now has been manufactured mostly in Germany.

Cinnamon comes from the bark of *Cinnamomum zeylanicum*, which is produced in greatest quantities in British India, and especially in Ceylon. Nevertheless, both this tree and *C. cassia*, which yields oil from its bark, were known in China as far back as 2700 B.C. and both of these items have been steady imports into the United States.

Plants With Export Possibilities

The last group of Chinese herbs with medicinal properties for which uses are mentioned constitutes a collection of plants largely made up of related or introduced species which in any case render China as a secondary or minor center of distribution.

Sesame seed (*Sesamum orientale*), the oil from which is occasionally used in medicaments in America, is a cultivated plant in China, where it is used in making lampblack for Chinese ink, and for making soap, as an illuminant, and as a substitute or adulterant for olive oil, as well as for a medicine. This plant originated in Africa and it is supposed that the Jews brought it to Palestine whence it spread to India and the Far East. It was cultivated in Egypt as far back as 1300 B.C.

Though Spain has been the greatest center of cultivation for licorice root, China has been gaining in importance as a source. *Glycyrrhiza glabra* is imported into the United States mostly from Spain, Asia Minor, Russia and Turkey, but it grows plentifully in North China, and quantities come from Mongolia and Kokonor. *G. echinata* is also mentioned as a source and *G. uralensis,* the Manchurian licorice root, since the first world war, has come into use. Chinese licorice (KAN TS'AO) stands next to ginseng in importance in Chinese pharmacy. It is considered as a great corrective adjunct and harmonizing ingredient in a large number of recipes, and it also has a place in American pharmacy.

Opium, so often wrongly associated with China, did not originate there. The smoking of it spread from Asia Minor, thence to Persia and from there on to India and China. Turkey was the great exporter of opium in

pre-war days. The unripe capsule of *Papaver somniferum* var. *album,* which is cultivated in India, is the source of opium. Japan has exploited the products, but China, while growing it locally, has not exported it to any degree. It has been entirely reserved for domestic consumption and occasionally, as might be expected, illegally by individuals who wished to exploit it for their own gain.

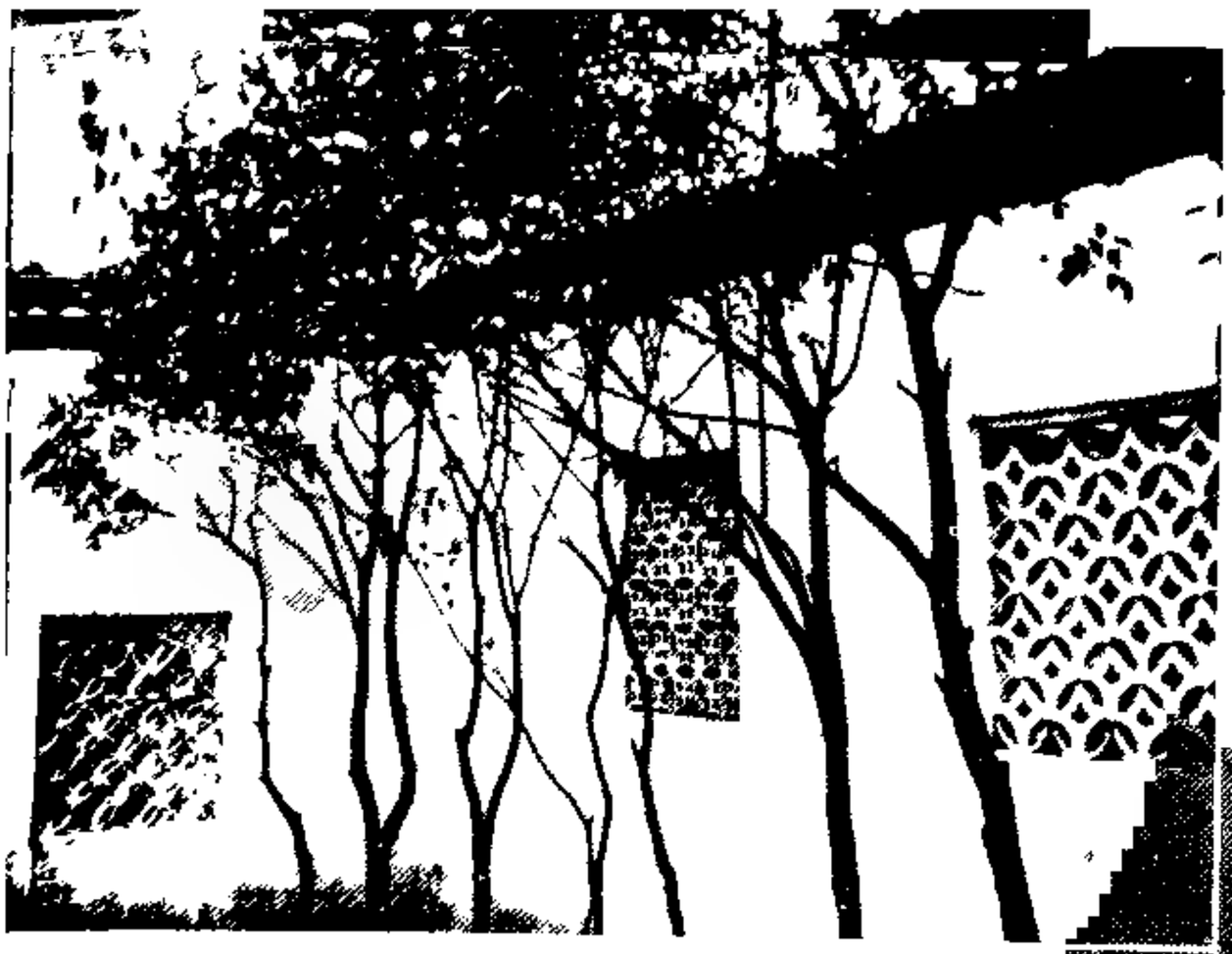
Chaulmoogra, in spite of its import into China from Thailand, is known in Chinese *materia medica* as Chinese chaulmoogra. From remote times the seeds of *Hydnocarpus* have been used in China for treatment of leprosy, but they did not attract outside attention until 1856. In 1858 chaulmoogra oil was first used experimentally in Paris. The source of Chinese chaulmoogra is *Hydnocarpus anthelmintica,* which has been proven to compare favorably with any other. Chaulmoogra oil also comes from *H. Kurzii* in Burma, *H. Wightiana,* an Indian species, and *H. castanea* of Burma and Borneo.

The true Chinese ginger, formerly thought to be *Languas Galanga,* has been definitely identified as *Zingiber officinale.* While the West Indies, where it is widely cultivated, seem to be the source of most of our ginger, the Chinese rhizomes are larger and more succulent. The rich alluvial lands of the Canton delta have been the chief producers of preserved ginger. In the United States Pharmacopoeia, Cochin ginger is distinguished from several other varieties used in medicine.

Castor oil, used medicinally as a purgative, comes from the beans of *Ricinus communis,* which, though a native of India, has been introduced into China, Japan, Brazil, the United States, and the United Kingdom. By far the greatest producer is Brazil, but Kwangtung in China has been a large center.

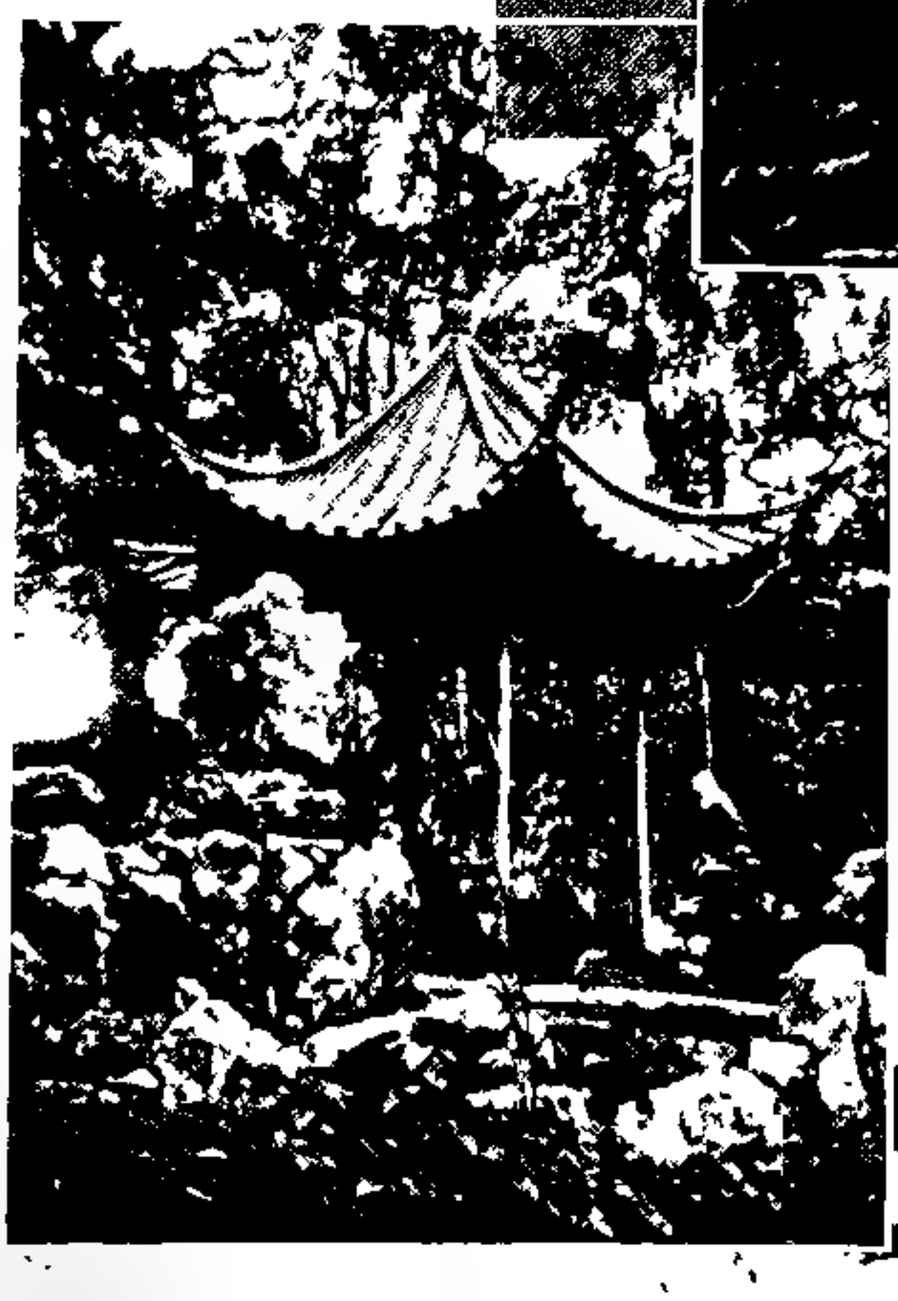
Some Chinese Counterparts of Western Drugs

China has many medicinal plants which are closely related to species that are used in America and Europe. *Gentiana scabra,* a Chinese species of gentian whose roots and rhizomes are medicinal, is paralleled abroad by the species *G. lutea,* a native of the mountainous regions of central Europe, where we obtain our supply of roots. *Polygala Senega,* the dried roots of which are the source of the drug senega, at one time used by the American Indians for snake bite, has its Chinese counterpart in *P. tenuifolia.* Aconite, obtained largely from *Aconitum Napellus,* native of the Alps and Pyrenees, though other species are also used, and coming chiefly from Spain, France and Italy, has its parallel in China in the species *A. Fischeri* and *A. Lycoctonum. Ulmus parvifolia,* the small-leaved elm of East China, the bark of which is mucilaginous, is comparable to the slippery elm, *Ulmus fulva,* of eastern North America. *Aloe vulgaris,* source of aloes coming from the West Indies, where the plant is naturalized, is related to var.



SOME TYPICAL CHINESE GARDENS IN NANKING

In the red-pillared pavilion are benches and a stone table where one may serve tea or sit alone reading Chinese poetry. Below: Lotus leaves and a heavy stone wall show the pres- of a pool in the two lower pictures. The flow- ering shrubs, including a rhododendron (above at right), the willow, and against the wall are



characteristic. The por rocks are part of the gar decoration. In the u which separate the co: yards, the open-work u dows are made of colo tiles or of carved wi painted frequently r Copings and roofs mostly of green tile.

Photographs by courtesy c United China Relief

chinensis, introduced into Curaçao from China in 1817. Many more such parallels might be cited if we had the space to tabulate them all.

Discoveries in Recent Investigations

Without commenting further on the still unmentioned numbers of Chinese herbs with medicinal properties which have already played a role in native Chinese medical practice, we should like in conclusion to call attention to the present status of investigations on these plants, namely, the proving and final evaluation of many of them now going forward under the skilled hands of progressive investigators. Some interesting results have been obtained. For instance, *Quisqualis indica,*[4] the Rangoon creeper, a panacea among Chinese physicians for numerous diseases of children, has been proved by clinical use and definite test a satisfactory substitute for santonin, and moreover it is less expensive. Apparently the volatile fraction contains the active vermifuge principle of the drug. Again the root of TANG-KUEI (*Angelica polymorpha* var. *sinensis*) has been used for centuries for female complaints. It was introduced into European *materia medica* 25 years ago as an emmenagogue. An extract has been marketed under the commercial name of Eumenol. It is a cerebral depressant. Unreported work shows that the active principles of this root have a strong specific action on uterine muscle, producing fleeting contraction.

Together with the testing of Chinese drugs is the more accurate determination of content, well illustrated in the case of analyses made in the recent past with certain plants which yield essential oils.[5] It has been found that *Mentha arvensis,* a mint, contains 1.09 percent aromatic oil; *Foeniculum vulgare,* 1.5 percent; *Illicium verum,* 4.2 percent; *Zingiber nigrum,* 0.25 percent; and *Amomum Cardamomum,* 4.5 percent, the last noted as having a pungent odor, and the second and fourth an "agreeable" odor.

In this brief and necessarily sketchy account I think we have shown that China has at her disposal an extensive as well as an important array of plants which medicinally are the match of those produced in other parts of the world. Moreover, there is definite evidence of the usefulness of some with which the Occident is as yet unfamiliar.

Besides the substances that in the past have been imported from China, it is likely, especially with present world conditions, that "new" medicinal plants, the knowledge of which originated over 5,000 years ago in the dawning light of Chinese civilization, will be entering the lists of American pharmaceuticals.

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[4] Kiang, Peter C. Chinese Drugs of Therapeutic Value to Western Physicians. Chin. Med. Jour. **37** (No. 9) : 742-746. Sept. 1923.

[5] Yu, T. and Wang, Y. Essential Oil Content of Chinese Drugs. Jour. Chin. Pharm. Assoc. **1** :209. 1936.

Courses Announced in New Educational Program

THE Victory Vegetable Garden movement, inaugurated and enthusiastically adopted since the beginning of 1942, has created such a widespread demand for instruction, not only in the home culture of food crops but also in the elements of gardening, that the New York Botanical Garden has organized a course entitled ***Basic Gardening*** and is also offering an autumn term of lectures in ***Vegetable Gardening,*** in addition to the previously scheduled subjects. Details of these courses are given in the 1942-44 edition of the Educational Program, just prepared, copies of which are mailed free upon request.

Both of the new classes will meet from 8 to 10 p.m. every other week. Several others during the year will follow a similar schedule to aid in the conservation of gasoline and tires. In addition, the hours have been set this year for the convenience of students wishing to travel on the New York Central either from downtown New York or Westchester County.

Members of the Garden, as usual, are granted a reduction in the fees paid for instruction.

The subjects being taught this fall are as follows:

Basic Gardening, alternate Thursdays beginning Sept. 24 at 8 p.m. T. H. Everett, Instructor.

Vegetable Gardening, alternate Mondays beginning Oct. 5 at 8 p.m. James B. Jack and Arthur King, Instructors.

Planting the Home Grounds, alternate Mondays at 8 p.m. beginning Sept. 28. P. J. van Melle, Instructor.

Cultivation of Trees and Shrubs (in the Two-Year Course in Practical Gardening) alternate Thursdays at 8 p.m. beginning Sept. 24. J. H. Beale, Instructor.

Plant Pests and Diseases (in the Two-Year Science Course for Professional Gardeners), every Monday at 8 p.m., beginning Oct. 5. Dr. B. O. Dodge, Instructor.

Ecology and Plant Geography (also in the Two-Year Science Course), every Monday at 9 p.m., beginning Oct. 5. J. H. Pierce, Instructor.

Field Botany, which began Sept. 12 to meet for seven consecutive Saturdays at 1 p.m., is being offered this year under the leadership of G. L. Wittrock in place of Dr. W. H. Camp, who is on leave of absence.

In the spring, three short courses will be given again: Practical Gardening, Disease and Pest Control, and Vegetable Gardening.

First Members' Day At Garden To Be Inaugurated Oct. 7

A SPECIAL series of programs for members of the New York Botanical Garden is being planned for the first Wednesday afternoon of each month, beginning in October. These will take place in the Members' Room, at an hour when New York Central trains will conveniently bring members both from Westchester County and the City. The following announcement is being mailed this month to each member of the Garden:

"The New York Botanical Garden invites its members to a series of programs to be given the first Wednesday afternoon of each month at 3:30 o'clock in the Members' Room. Speakers selected

will either be members of the staff, who will acquaint the members with interesting phases of the Garden's work, or other authorities in specialized fields concerned with plant life. Special exhibits of books and other pertinent materials will be arranged.

"Tea will be served at the close of each program. Members will be privileged to bring individual guests, but the meetings will not be open to the public. The membership card must be shown at the door."

The first three programs will be as follows:

October seventh

Richardson Wright, Editor of House & Garden

"Early New York Seedsmen and Nurserymen"

November fourth

H. A. Gleason, Assistant Director & Head Curator

"Botany in the Service of the Public"

December second

A. B. Stout, Curator of Education & Laboratories

"Some Simple Facts About Plant Breeding"

Free Lectures Given For Victory Gardeners By Garden and "Times"

AGAIN in co-operation with the New York Times, the New York Botanical Garden has arranged a series of free lectures for gardeners. The previous series, which dealt with vegetable gardening, was given late last winter. The present series has been planned especially for persons who have had Victory Vegetable Gardens during the past season and who wish to reap from them the greatest possible benefits.

Canning and storing of home-grown vegetables and fruits are the subjects of the two opening lectures, the first being given by Esther C. Grayson Sept. 16 and the second by James B. Jack the following Wednesday evening.

"Running Start for Next Year's Garden" will be the subject of the third lecture, to be presented by T. H. Everett the evening of Oct. 14. The course will be concluded Oct. 21 with George H. Gillies speaking on "Fruits for Home Gardens."

The lectures are being given on Wednesdays at 8 p.m. in the New York Times Hall, 240 West 44th St. While admission is free, tickets are required, and these are available through F. F. Rockwell, Garden Editor of the New York Times, who is chairman of the programs.

Robert Scott

ONE of the best known and most beloved among the professional gardeners of the New York area, Robert Scott, succumbed to a brief illness at Northern Westchester Hospital the morning of Aug. 18. He was a member of the teaching staff in practical gardening at the New York Botanical Garden.

For the past 20 years Mr. Scott had been Superintendent of the estate of Mrs. W. A. M. Burden near Mt. Kisco, where he won an enviable reputation for the quality of the vegetables which he grew and exhibited each year at the Fall Flower Show in New York, and where he also was known for his ability to raise successfully any type of plant, from leeks to orchids. Among his associates he was known as a "natural" gardener.

Mr. Scott received his early training at some of the finest gardens in Scotland, and the cultural practices that he learned in his youth served to bring him many prizes at flower shows in this country and to give him uncommon ability as a judge. At Mt. Kisco he trained a number of young men who have since become known in the gardening world, among them James S. Jack, who is now teaching in some of the courses at the Botanical Garden.

For many years Mr. Scott has been an ardent supporter of the Garden, being one of the first to encourage the establishment of the organized training in gardening for young men which is now a regular part of the Garden's work.

Mr. Scott, who was 65 years old, is survived by his widow, a daughter, Mrs. Adrian Frylink, and a brother.

In the Garden's Educational Program, where he was to teach Outdoor Gardening Practice and part of the Three-Day Short Course in Practical Gardening, his place is to be taken by Arthur King, Superintendent of the estate of Mrs. Jesse Isidor Straus at Mt. Kisco, who is also scheduled to give instruction in three other of the Botanical Garden's courses.

Autumn Lectures at the Garden

Sept. 26 ***Flowers the Year Around***
A natural-color motion picture of the Botanical Garden

Oct. 3 ***Highlights in the History of Grapes***
A. B. Stout, New York Botanical Garden

Oct. 10 ***Garden Roses in October*** –A discussion of culture and varieties
P. J. McKenna, New York Botanical Garden

Oct. 17 ***Bulbs for Beauty in 1943***—How and what to plant this fall
Ethel Anson S. Peckham, Honorary Curator, N.Y.B.G.

Oct. 24 ***"The Desert Shall Blossom . . ."***
A motion picture in natural color. *Alice Chauncey*

Oct. 31 ***Battling Garden Pests While They Sleep***
B. O. Dodge, New York Botanical Garden

Nov. 7 ***Insect-Eaters***
Color close-ups of carnivorous plants. *Rutherford Platt*

Nov. 14 ***Yeast A Billion-Dollar Microscopic Plant***
With a motion picture made under the miscroscope.
George Kirby, The Fleischmann Laboratories

Nov. 21 ***Forty Years of Reforestation in New York***
E. W. Littlefield, State Dept. of Conservation

Nov. 28 ***The Beauty of the Diatom World***
Joseph F. Burke, Honorary Curator, N.Y.B.G.

Dec. 5 ***Scenery and Gardens of Bermuda***—in kodachrome
Fred J. Seaver, New York Botanical Garden

Dec. 12 ***Decorative Greens for the Holidays***
Mrs. William G. Wheeler & Mrs. Henry Kistner

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Foundations of Botany in America Shown Through Torrey's Life

JOHN TORREY: A Story of North American Botany. Andrew Denny Rodgers III. 352 pages, index, bibliography; foreword by Samuel Wood Geiser. Princeton University Press. 1942. $3 75.

All those interested in the history of American botany will want to read this biography of John Torrey. Mr. Rodgers has brought together a wealth of material, not only on the life and work of Dr. Torrey but also on the botanical exploration of this continent from the first collections of Bartram, Kalm and Michaux down to 1873 when Torrey died. From its title one might suspect that the book had two separate themes, the biography and a history of exploration. The two are bound together by the activities of Torrey. He corresponded with all the important plant explorers, encouraged them to collect and, with the co-operation of others, worked out most of their collections.

Torrey was born in New York City in 1796 and began to study and collect

under Eaton while still a lad. At that time there were many places in the East that were unexplored, even in New York and New Jersey. Much of what is now the United States was not under our flag. The exploration of the West was just beginning. More than any other botanist he was responsible for assembling the materials brought back by dozens of expeditions and making the preparation of a Flora of North America a possibility. He was not a great collector himself but he was able to stimulate others and he described and systematized their discoveries.

He built up a fine collection in New York which became the nucleus of the Columbia Herbarium, now on loan to the New York Botanical Garden. He founded the U. S. National Herbarium at Washington, supervising the mounting of the first collections and arranging them in their proper sequence. He also did a great deal toward building up the Harvard collections, co-operating with his most famous pupil, Asa Gray.

Torrey was a man of sterling character and many abilities. It will be a surprise to many to learn that he was not a professional botanist. He graduated from Columbia as a doctor of medicine and earned his living for many years by teaching chemistry. Botany was for him a labor of love. He had a great talent for friendship and was an excellent correspondent. Mr. Rodgers tells most of his story by quoting freely from his letters. He was a great worker, publishing important floras and plant catalogues.

Mr. Rodgers has done a fine, accurate piece of work with a good bibliography and index. I am looking forward to reading his life of Asa Gray and other botanical heroes, now ready for publication.

RALPH R. STEWART.

Winter and Summer Tree Guide

TREES OF THE EASTERN UNITED STATES AND CANADA. William Harlow. 288 pages, illustrated, indexed. Whittlesey House, New York, 1942. $2.75.

It seems strange that it has taken until this late date for a book to be written on trees which includes both summer and winter identification characters and woodcraft uses all in one small pocket-size volume. What is more to the point, the book is extremely usable and is presented in reasonably popular language. Here is the most useful work of its kind and one for which this reviewer wishes a popular future among nature lovers, Boy and Girl Scouts, and in classes where one is taught living plants, not dried and theoretical botany.

E. J. ALEXANDER.

The "Why" of Wood Behavior

WOOD TECHNOLOGY. Harold Donald Tiemann. 316 pages, 85 illustrations. Pitman Publishing Corp., New York, 1942. $3.50.

This book is a revision of the author's "Lessons in Wood Technology" which were published serially in the *Southern Lumberman* from July 1938 to April 1941. It begins with an account of the importance of timber to civilization and explains what wood is and how it is formed in the living tree. With this basic knowledge the reader is able to follow the discussions of wood with reference to its physical and chemical properties, its behavior in drying or in absorbing moisture, its resistance to decay or insect attacks, and its manifold applications in industry. The book is not an exhaustive treatise, as it leaves many parts of the vast field untouched, but is, rather, a series of lessons given by a scientist who has had a long and distinguished career as a wood technologist and who is able to write instructively in a simple and lucid manner.

SAMUEL J. RECORD,
Yale University.

Guide for the Middle South

A SOUTHERN GARDEN. A Handbook for the Middle South. Elizabeth Lawrence. 241 pages, indexed. University of North Carolina Press, Chapel Hill, N. C., 1942 $3.

A lively discussion of various types of plant material and their value as garden subjects in the Middle South. Miss Lawrence, though ever mindful of old favorites, has been quick to try new and different plants in her own garden and to observe the happenings in her neighbors' gardens. Her observations and records kept over a period of years form the basis for this practical, informative handbook. It will make interesting reading and a valuable aid to gardeners beyond the limited area for which it was intended.

CAMILLA BRADLEY, *Editor,*
Home Gardening (New Orleans).

Notes, News, and Comment

China. The editorial this month, "America's Horticultural Debt to China," bears the signature of Madame V. K. Wellington Koo, wife of the famous Chinese Ambassador to England. Madame Koo is an ardent worker for United China Relief, the organization which coordinates the numerous agencies that are seeking financial and other aid for the Chinese people. It is with the needs of her own great country in mind that Madame Koo is reminding Americans, through this editorial, of one of their many obligations to her land across the Pacific.

Daylilies. Continuing the Chinese theme presented this month, the Journal for October will contain an article on the daylilies from China that have been used in breeding work by Dr. A. B. Stout.

Haiti. Dr. W. H. Camp, on leave of absence for the duration of the war, recently left by plane for Haiti where he will be associated with the Société Haitiano-Américaine de Développement Agricole, a corporation established to expedite the production of economic crops which are vital in the present emergency.

Central America. Mr. B. A. Krukoff returned Aug. 26 from a six weeks' trip which took him into Guatemala, Costa Rica, and Mexico in search of new supplies of certain tropical plants that are of importance to the United States in the present world situation.

Waterlily. The finest specimen of the Santa Cruz waterlily (*Victoria cruziana*) which has ever been grown at the Garden has been blooming for several weeks in the aquatic house in the Main Conservatories. The last of August the plant covered an area 21 feet across, and a few days later the leaves were touching the sides of the pool, which measures 24 feet. Sixteen full-size leaves were then floating on the water, each approximately 4½ feet in diameter with a circumference of more than 14 feet and a margin 5 inches high. The plant has been attracting much attention from visitors, and pictures of it have appeared in several of New York's newspapers. This spectacular waterlily from South America is almost identical with *Victoria regia.*

New Staff Member. Dr. Frances Wynne came to the Garden September 1 as Assistant Curator on the taxonomic staff. She was granted her doctor's degree in June by the University of Michigan, where she did special work on the moss genus *Drepanocladus.* Her work at the Garden will be mainly on flowering plants. Dr. Wynne was graduated from Allegheny College, Meadville, Pa., in 1938 and received a master's degree in botany from Michigan the following year.

Bermuda in Maine. Dr. F. J. Seaver lectured on Bermuda before the Camp Fire Club of Acadia National Park in Maine Aug. 18. During his vacation trip there he made a large collection of fungi, among them a rare species of *Hydnum.*

Breeding Work. Dr. A. B. Stout is spending the last three weeks of September at Williamstown, Mass., and Geneva, N. Y., in his work with the hybridization of fast-growing poplars and hardy seedless grapes.

Editor. The September number of the *Gardeners' Chronicle of America* is appearing under the editorship of James G. Esson, who has been appointed to succeed Dorothy Ebel Hansell, resigned. Mr. Esson has written extensively for this magazine and for others over a number of years, and he has long been known as a gardener of outstanding reputation. He received his early training on some of the largest estates in the British Isles, and in this country he was one of the first graduates of the New York Botanical Garden's Science Course for Professional Gardeners, receiving his certificate in 1934. In 1936 he was the winner of the George D. Pratt Medal of Achievement for Professional Gardeners, awarded by the Horticultural Society of New York, and he has twice been the winner of the Holland Gold Shield at the International Flower Show, where he has been known both as a judge and an exhibitor. For a number of years Mr. Esson has taken part in the New York Botanical Garden's educational activities. He has lectured at the Garden and has written for *Addisonia* and the Journal, and since 1938 he has been an instructor in the Garden's Educational Program, teaching Cultivation of Trees and Shrubs, Indoor Gardening Practice, and Choice Plant Material, a new course to begin in

January. Mr. Esson continues in his post as Superintendent of the estate of Mrs. Roswell Eldridge at Great Neck, where he has been for the past 14 years.

Secretary. William B. Ash, who was appointed a temporary gardener at the Botanical Garden in January, resigned August 1 to become National Secretary of the National Association of Gardeners, with an office at 432 Fourth Avenue, New York City. He was graduated in 1941 from the Two-Year Course in Practical Gardening and in June 1942 from the Science Course for Professional Gardeners. He had previously worked as a gardener on the Marshall Field estate, also at Northport, L. I., after having devoted several years to work with trees. In his new secretarial post, he is succeeding Dorothy Ebel Hansell, who resigned the first of August.

In the Picture. Miss Florence L. Barrows of Millburn, N. J., has provided identifications for several persons who appeared in the photograph in the July number of the Journal, showing the Torrey Club's 75th anniversary celebration at the Garden. She has written to say that No. 43, not 50, is Miss Clara S. Hires; 44 is Miss Ruth C. Yates; 50, Mrs. Fern Crane; and 51, Miss Penelope Smith, all of them from Miss Hires' Mistaire Laboratories at Millburn.

C. L. Porter, Professor of Botany at Purdue University, Lafayette, Ind., is No. 108. He attended the meeting as a delegate of the Indiana Academy of Science. Mrs. Marie Siegele of Bergenfield, N. J., is No. 102.

Serving Their Country. Gardeners and student gardeners who have left during the past year for service with the armed forces of the United States include:

Charles Pecora, who started as an apprentice in April 1939, became a student gardener 13 months ago, and left on August 1.

Theodore James Olack, a student gardener since April 1940, who left to join the Coast Guard August 20.

Edgar Bryant, who had a brief career of three months as a student gardener, leaving Aug. 22.

William P. Feltges, a student gardener who began April 1, 1939 and was appointed gardener in November 1940, leaving a year ago this month.

Joseph Bonadies, a student gardener from March 16, 1940, and a gardener from May 1, 1941, who left May 15.

Hamilton Dunn, who had been a student gardener since April 1941 and who left May 1.

David B. Paterson, who volunteered and left Jan. 3, after six months as a student gardener.

John Uhelski, a temporary gardener beginning last September, who left the Garden in April.

Also, mentioned in the January Journal:

John J. Engett, who volunteered for service at the end of the year, and is now taking officers training. He had been a student gardener since the preceding April.

Lawrence Hadlund, a volunteer of the same period, who had begun as a student gardener in April 1940.

New Jobs. Esther Zimmer, scholarship student who has been working during the summer with Dr. B. O. Dodge, has been appointed by the Carnegie Institution as an assistant to Dr. Alexander Hollaender at the National Institute of Health at Bethesda, Md. She will continue to investigate mutations in *Neurospora,* the pink breadmold, using irradiation experiments.

Anita G. Appel, a summer scholarship student in Dr. A. B. Stout's laboratory, commenced September 8 to work on heterocaryotic vigor in the fungi under Dr. B. O. Dodge.

Visitors. Dr. Thomas Laskaris, who has recently been appointed an assistant on the staff of the Rockefeller Foundation at Princeton, N. J., visited the Garden late in August to inspect the delphiniums being grown for the disease-investigation project he was formerly carrying on here at the Garden.

Other August visitors included Dr. Mary E. Reid of the U. S. Public Health Service, Washington, who is doing some important work in the investigation of the periodic variation in the vitamin content of fruits and vegetables; Dr. S. Philip Goodhart, Professor of Clinical Neurology at Columbia University, and Dr. George H. Hitchings of Burroughs-Wellcome Co., both of whom came to consult with Dr. Robbins; E. E. Naylor, University of Missouri; John C. Wister, Philadelphia; Naomi Mullendore, Franklin College, Ind.; Wanda K. Farr, Greenwich, Conn.; Wilbur Wright, former student gardener who completed the Science Course in 1939 and later entered Cornell, and is now training in Texas to become a bombardier; Ronald Townsend of New Orleans, another former student gardener; and Percival Wilde, author of "Tinsley's Bones" and other best-sellers, who, as an amateur mycologist, came to consult Dr. F. J. Seaver on material for a radio broadcast.

THE NEW YORK BOT

THE NEW YORK BOTANICAL GARDEN

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to the Botanical Garden station; or drive up th

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The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

THE LIBRARY SERVES LITERATURE

IN this day of biographical writing, the lives of the great American botanists are just being discovered In the past three years William Starling Sullivant, Amos Eaton, and John Torrey have been the subjects of exhaustive books. A fourth work concerns Dr Samuel Bard (of Hyde Park), whose botanical and horticultural interests rival his medical prowess and his social foresight. Facts for the first three and for part of the fourth book were gathered largely in the New York Botanical Garden's library, where there is one of the country's largest collections of source material on botanists and their work.

The article "Plants of the Holy Scriptures' written by Eleanor King for this Journal in 1941 and followed by a Macmillan book, "Bible Plants for American Gardens," was inspired by Dr H N. Moldenke's mimeographed volume of 135 pages, prepared as part of his work, and was supplemented by the author's own extensive research, also largely done at the Garden.

Artists as well as writers find the Botanical Garden's library indispensable. Helene Carter, who has illustrated a garden flower and a fruit book, Tabea Hoffman, who made drawings for "Plants in the Home" and Gretchen Harshbarger, whose sketches accompany the text of the "Flower Family Album," have all spent many hours there Many of the stories in Margaret McKenny's books for children on wild flowers, garden flowers, and trees were gleaned from the library shelves. The experiences of other gardeners, as found in books and periodicals in the Botanical Garden's library, were added to her own by Harriet K. Morse in writing "Gardening in the Shade." Some of the background preliminary to Cecile Matschat's preparation of "Suwanee River" came from this same source.

The technical works in botany that have depended on the Botanical Garden's personnel and books for a portion of their contents are many, and the magazines that call upon the library repeatedly to unearth facts or verify statements are innumerable.

The fact that the Garden's books, pamphlets, and periodicals are so extensively used places a responsibility upon the institution and its friends. It is imperative to keep the collections up to date and to add as much as possible of historical source material when it is available. Gifts of botanical and horticultural manuscripts and books, new or old, serve a manifold purpose in increasing the Botanical Garden's reference material for the use not only of scientists and laymen, but for writers of all sorts—popular, technical and literary

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Daylilies of Chinese Origin

By A. B. Stout

THE native flora of China has supplied several of the most distinctive of the earlier known species of the genus *Hemerocallis*. Recent introductions of living plants from China have continued to provide new species and botanical varieties which greatly increase the diversity of this relatively small genus and provide noteworthy characters of value in the development of new classes and clones of horticultural daylilies. In the efforts to obtain these, the New York Botanical Garden has, during the past twenty years, received from various provinces in China more than fifty collections of living plants and seeds of *Hemerocallis* from which numerous plants have been grown for study and for use in hybridizations and selective breeding. Already two new species (*Hemerocallis multiflora* and *H. altissima*) and one botanical variety (*H. fulva rosea*) have been described. Some of the facts regarding these daylilies, derived both directly and indirectly from China, are presented here with special reference to the introductions from the New York Botanical Garden.

The botanical variety Hemerocallis fulva rosea

Three individual plants with rosy-pink flowers came to the Botanical Garden in 1924 in a shipment of wild fulvous daylilies collected near Kuling, China, by Dr. Albert N. Steward. No other plants with this shade of flower coloring have ever been received in the collections of living plants or seeds sent from the Orient.

The botanical name *Hemerocallis fulva rosea* was given to this pink-flowered variety, which includes (1) the three original wild plants, (2) their intra bred progenies, and (3) the wild members of this type which may exist in China. A flower of the particular plant from the wild which was selected as the type plant was illustrated in a colored plate in

Flowers of wild daylilies from Kuling, China, some of which, with color variations in rosy-pink and crimson-red, have given rise to two new classes of daylilies in these colors.

Addisonia (Pl. 484) in 1930. This plant was propagated as a clone which was given the horticultural name of ***Rosalind.***[1] Ramets of this clone were first distributed from the New York Botanical Garden (later by the Farr Nursery Co.) as the type plant of the botanical variety. Hence, ***Rosalind*** is not a species, as it has been frequently called in catalogs and other horticultural writings, but a clone representing propagations of one individual which happens to be the type of the entire population of the variety. The members of this pink-flowered variety are somewhat variable in respect to color pattern. ***Rosalind*** has a strongly banded three-toned color pattern.[2] Another named clone of the variety (***Charmaine***) has flowers with a two-toned distal pattern in which the band of more intense coloring is absent.

In hybridizations the pink color character is decidedly recessive in F_1 progenies. The F_1 hybrids created by crossing *H. fulva rosea* with non-fulvous yellow- and orange flowered types are almost always dull fulvous and without true pink tints. But in later generations pink tinges segregate in a diversity of patterns and in gradations to other red colors.

The pink-flowered variety and its hybrid segregates constitute a rather distinct class of daylilies that are of special value in horticulture.

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[1] Described in *Horticulture* II. **16**: 226. 1938.
[2] See the description of color patterns in Jour. N. Y. Bot. Gard. **42**: 40-42. 1941.

Scarlet-red daylilies

All the fulvous-colored daylilies thus far received from China evidently belong to the one somewhat variable species *Hemerocallis fulva,* of which the old familiar and widely cultivated clone ***Europa*** [3] is the Linnaean type. The variations in coloring range from dull fulvous to colors that approach spectrum-red, scarlet-red, and scarlet as these are represented in the Ridgway Color Standards. A few of the plants collected by Dr. Steward near Kuling in 1924 had such coloring. Selective breeding from these has given a new race of which the clone ***Red Bird*** is fairly representative. A more complete discussion of this and of other classes of red-flowered daylilies developed by breeding will be published in the volume of *Herbertia* for 1942.

Hemerocallis multiflora [4]

Plants of *Hemerocallis multiflora* have smaller flowers than has any other species now known, and the flowers are numerous on the much-branched scapes. Clear orange in color, they bloom by day over a long period with their climax in late August and early September. Over winter the plants are entirely dormant and fully hardy. In the experience of the writer plants of this species do best when grown in full exposure to sun and in soil that is not very rich. Then the scapes of well developed plants stand erect to a height of about three feet and there are numerous flowers day after day for a period of about five weeks.

Plants of the species *H. multiflora* have been used at the New York Botanical Garden in numerous hybridizations that have been followed by selective breeding. Thus the most distinctive characters of this species have been combined with desirable characters of other species, such as yellow and red in the flower coloring, midsummer period of blooming, and difference in stature, both taller and lower, with the result that distinctly new classes of horticultural daylilies have been obtained. Among the clones of these that have already been introduced are ***Autumn Pioneer, Autumn Prince, Bijou, Boutonnière, Hiawatha,*** and ***Port.***

Among all the collections of plants and seeds that have come to the New York Botanical Garden, only ten have definitely been assigned to the species *H. multiflora.* These were obtained in one locality in the Province of Honan by Dr. Albert N. Steward, who considered at the time that they were members of the species *H. flava.* There are no further data on the natural distribution of this species. From two sources in Korea have

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[3] Jour. N. Y Bot Gard. **30**: 129-136. 1929.

[4] Several papers which discuss the species *H. multiflora* have been published. The original botanical description was in *Addisonia* (Plate 464, 1929.) A somewhat popular account of this species was printed in the Journal of the New York Botanical Garden in 1930 (**31**: 34-39). A section on this species is included in the author's volume "Daylilies" which was published in 1934.

come plants that are similar to the type and co-type plants of *H. multiflora* in color and size of flowers, but these are at present too immature for a final evaluation as to specific identity.

Hemerocallis altissima

The species *Hemerocallis altissima* has been described botanically in a manuscript already submitted for publication in the forthcoming volume of *Herbertia* for 1942. Hence only brief mention of this new species will be made here. Plants of *H. altissima* are the tallest of all the species of daylilies known to the writer. The flowers are strictly night-blooming, and the season of bloom extends throughout August and September.

The type and co-type plants of the species *H. altissima* were collected on Purple Mountain near Nanking in 1924 by Dr. Albert N. Steward as an unidentified type of yellow-flowered daylily. But several collections of plants and seeds in the region about Nanking have contained specimens with the same characters, so evidently the species is common as a wild plant in that area.

Hybrids with plants of *H. altissima* as a parent have already been obtained. As a result of hybrid vigor, some of these are still taller in stature. The F_1 hybrids of *H. altissima* x *H. multiflora* have day-blooming flowers that are intermediate between yellow and orange. These plants are less tall than are plants of *H. altissima* but the scapes are more branched. Thus, hybridizations with the night-flowering *H. altissima* have given a class of tall, late-flowering, and day-blooming daylilies. Further selective breeding is in progress to extend the range of flower colors and the season of bloom in a new race that may be called giant in stature. Thus far, none of these seedlings can be considered good enough for distribution for cultivation in gardens, but they give promise of worthy hybrids for the future.

The Chengtu Daylily

The name ***Chengtu*** was given in 1935 [5] to a daylily clone that was then being grown as a cultivated crop in the Province of Szechuan, for the flowers which are gathered and used as food.[6] Ramets of this clone came to the New York Botanical Garden in 1930 from Mr. W. P. Hsieh of Chengtu University and distributions to the trade were first made by the Farr Nursery Co. in 1937.

This daylily has attractive scarlet-red coloring in a banded pattern and the season of bloom extends well into August at a time when no named clone in its color class is in flower.

The Hankow Daylily

The ***Hankow Daylily***, first described in 1939,[7] is a clone said to be extensively cultivated near Hankow, China, for the substance of the flowers

[5] Jour. N. Y. Bot. Gard **36**: 216 and *Horticulture* II. **13**: 394. 1935.
[6] See article on "Gum-Jum or Gum-Tsoy" in Jour. N. Y. Bot. Gard. **34**: 97-100. 1933.
[7] Jour. N. Y. Bot. Gard. **40**: 340.

in soups and other dishes. Ramets of this clone were obtained in 1933 through the courtesies of the United States Consul at Hankow. This clone was first listed by the Farr Nursery Co. in 1939. The flowers are rather large and rich yellowish-orange in color with a bold mid-band of jasper-red or scarlet in the petals. The period of bloom is from the middle of July into August.

Our tallest daylily, with the author beside it. Hemerocallis altissima is one of the parents of this new hybrid.

Other daylilies from China

A total of 27 collections of living plants and seeds of *Hemerocallis* has come directly from China's central provinces to the New York Botanical Garden. Of these the daylilies mentioned above are distinctly new and of special horticultural value. Several collections besides the one made by Dr. Steward which included plants with pink and with crimson-red flowers have been fulvous-colored daylilies that must also be included in the species *H. fulva.* One collection consisted of wild plants of the species *H. citrina,*[8] which played an important role in the early hybridizations by Willy Müller in Italy and by Mr. Bernard H. Farr in America, resulting in the production of several excellent large-flowered hybrids (***Sir Michael Foster, Parthenope,*** and ***Ophir***).

The plants of several collections which came to the Garden from China are somewhat similar to the type plants of *H. Thunbergii,*[9] which were sent from the Orient to England as early as 1873. From two collections of seed made by Joseph Rock on the slopes of the Likiang Snow Range in the Province of Yunnan in southwestern China, were grown plants of *H. Forrestii.* These are parents of a considerable number of hybrids.

Wild plants of the dwarf species *H. nana* are at present known only in a small area in the Province of Yunnan. Plants true for this species have been grown in the British Isles and divisions and seeds of some of these have come to the New York Botanical Garden. Hybrids between *H. nana* and several other species have been produced at the New York Botanical Garden.

From the provinces in the North of China (Manchuria and Mongolia) and from Korea thirty different collections of live plants and seeds have been received and grown at the New York Botanical Garden. Among these have been numerous members of the species *H. minor* and *H. Middendorffii* which provide material for a study of the variations that naturally occur in these species. Of special interest are a few plants of *H. Middendorffii* that are truly dwarf in stature. These have been used as parents in the development of a group of complex hybrids that are dwarf or semi-dwarf and early flowering, but quite diverse in respect to flower coloring.

The latest shipment of daylilies which the writer has received from China arrived in 1940. At that time special efforts were being made to get seeds from areas in China from which daylily seeds had not previously been obtained. But the conditions that have developed in the Orient now make the shipments of such collections impossible.

Without doubt there are wild species of *Hemerocallis* in China that are

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[8] Plants of this species were originally sent from the Province of Shen-si, China, to Florence, Italy, and first described in 1897. (See Plate 482 in *Addisonia,* 1930.)

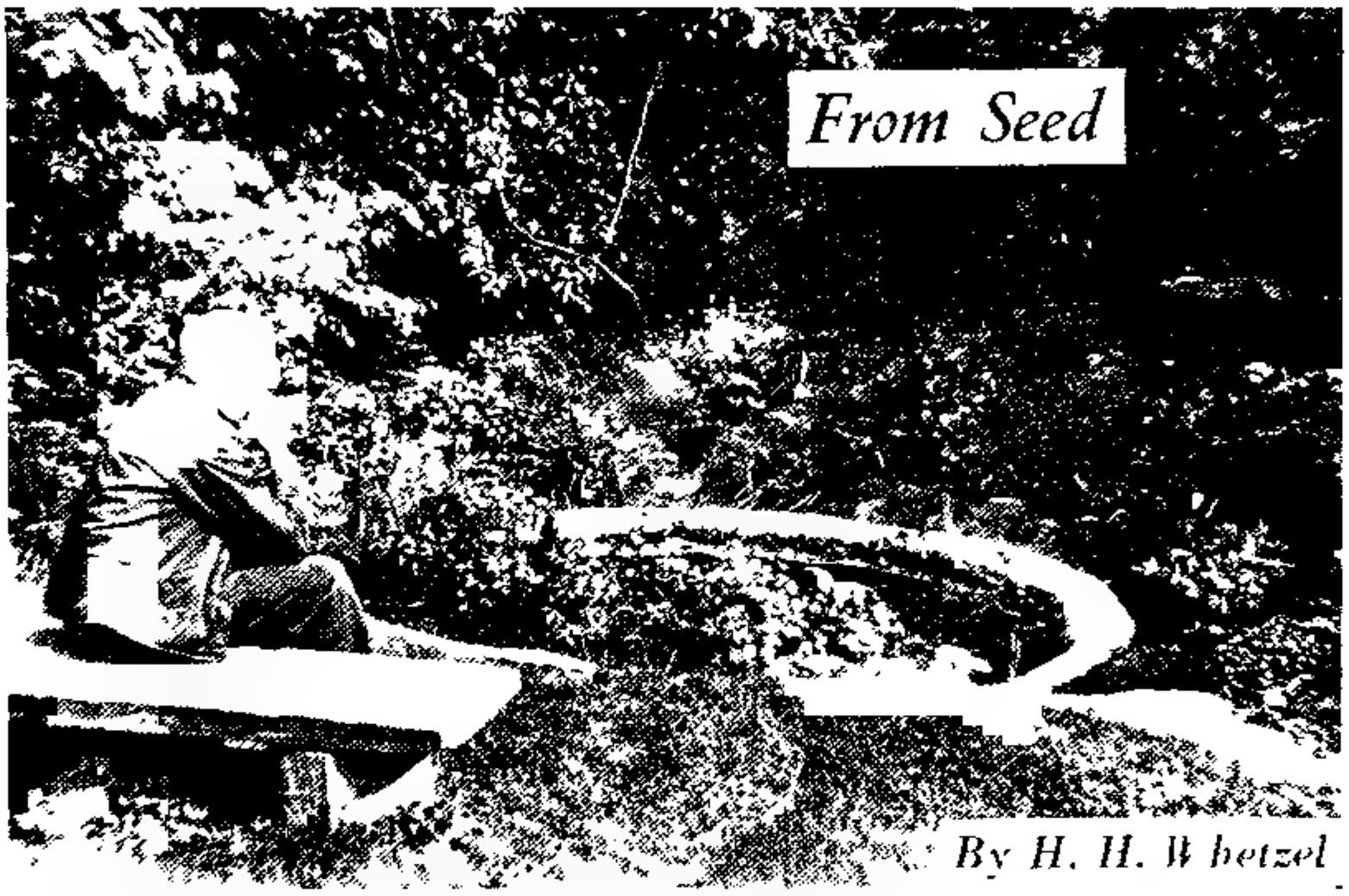
[9] See *Addisonia,* Plate 459, 1929.

Flowers of Hemerocallis multiflora, a species that has been extensively used in selective breeding.

now unknown in botanical literature, as well as variations of species already named. What these may be like is mere conjecture, especially when one considers the extreme diversity in the species already known from China. The greatest prize to be hoped for is perhaps plants whose flowers regularly remain open and in good condition for at least three days, surpassing the most extended anthesis now known in daylilies. Another desirable new character is that of truly white flowers.

But the species and varieties of *Hemerocallis* that have already come from China to Europe and to the United States have already played a major role in the breeding that has developed the horticultural daylilies of today.

Growing Wild Flowers



MANY of our native wild flowers make wonderful plants for the rock garden, the borders, or even the conventional flower bed. Most people seem to think the only way to get them is to dig them up from the woods or meadows or buy the rarer ones from some nurseryman. Since they usually know the wild flowers only when in bloom, they dig them some Sunday afternoon, then too weary with the day's jaunt they leave the poor things in an open basket until a day or two later before they plant them. Of course they select the largest, which usually are the oldest plants in the woods. Even if they are set out most expeditiously and well watered, such plants rarely come up to the digger's expectation the next year if come up they do at all. Like old folks they don't transplant well.

Wild flowers, like all other plants, do best if grown from seed and transplanted when young and vigorous. There is no secret formula for growing wild flowers from seed. Did it never occur to you that most plants grown in gardens are wild somewhere? Only a few of the old stand-bys can be truly said to be cultivated plants; that is, bred up and domesticated to the point where they can't take care of themselves if left to their own devices.

I have grown many of the wild flowers from seed and find it just as easy as growing the so-called cultivated sorts. The first problem is to get

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the seeds. If the species you wish to grow are to be found in the region where you live, spot the plants you admire in their native habitat and gather the seed when it ripens. This calls for frequent trips to their haunts for most of them ripen their seeds and scatter them usually within a short period of days.

You can dig the selected plants when in full bloom if careful to disturb the roots as little as possible, plant at once and water frequently until seed ripens in your garden. A single plant thus treated will often yield plenty of seed for the planting. Several seedsmen offer seed of a great variety of wildlings. However, those you gather yourself are likely to prove more satisfactory, for the seeds of many wild flowers germinate best if planted as soon as ripe. If you don't know that the seed will keep for some months, plant at once.

I find it best to plant seeds of wild flowers in flats which I set on the north side of my garage. I water them occasionally until winter covers them with snow. Some germinate in late summer or fall but many require a rest and the cold of winter to bring them to germination. Many too grow very slowly and may best be left in the flat during the season following the sowing or longer. When large enough, transplant to their permanent location just as you would any other plants. It is best, of course, to provide as nearly as possible natural conditions for these wild things. If they grow in deep woodlands, then plant them in the shady part of the garden, but try a few of the seedlings in the sunnier places. Most of our early spring flowers grow in the woods, but remember, they spring up and flower before the trees come into full leaf, so really they are sun-loving. Many ripen their seed quickly and their foliage dies off by mid-summer. They may fool you and do best in full sun.

Then too, some attention must be given to the character of the soil in which they naturally thrive. If they grow on a wooded hillside, a well drained soil is indicated; if in swamps or wet meadows, the moister spots in your garden will be called for. But here again you may be surprised. I have always liked *Senecio aureus* which makes the springy, boggy meadows here-abouts a veritable cloth of gold in May and June. I set a few plants in my dry gravelly border some years ago. They throve prodigiously and even seeded themselves round about. Some thirty years ago, I brought half a dozen plants of *Stylophorum diphyllum* from a hardwood forest of central Indiana and planted them in the half-shade of my wild-flower border. Two of the original plants still stand and thrive just where I set them three decades back, but their progeny now spring up all over the place and make robust youngsters the second season whether in deep shade or full sun. This is one of the loveliest early poppies I know, with a profusion of two-inch yellow blossoms during all of May and into June. I gather the soft-spined pods just before they open and plant the seed at once in flats to give my friends next spring.

I'm a Hoosier and so often hark back to the woodlands of my childhood and my college days where old flower friends unknown here in New York grow in profusion. I have succeeded in establishing several of those wild-wood treasures in my garden. One of which I am very fond is *Isopyrum biternatum,* one of the daintiest wind-flowers of our mid-west woodlands. A small clump which I brought from the campus of Wabash College many years ago still thrives in the deep shade of an old lilac bush, while here and there in the adjacent wild-flower border the white blossoms of its seedling children nod knowingly to me of April mornings. Its seed must be sown shortly after it ripens.

Another Hoosier treasure is *Trillium Gleasoni* from Turkey Run. I brought back a dozen plants in full bloom some years back and planted them on the north side of the wild-flower border. They took to the Empire State soil just as I have done and are now the tallest and choicest of the twenty-odd species of *Trillium* in my garden. Yes, you can grow trilliums from seed but you must start while you are still fairly young. I have seedlings of *T. Gleasoni* now two years old but they still show only a single juvenile leaf each. Shall I live to see them flower? I don't know. Eight years ago I sowed a generous collection of the seeds of *Trillium grandiflorum* in an ideal spot on the wooded hillside which fronts my garden on the west. The first year they put forth roots only. The next year a tiny leaf appeared. A year ago last spring a few of the seedlings first gave flower. I transplanted them the following summer and last May about half of them blossomed, but they are all still quite slender like girls in their 'teens. I once had dreams of hybridizing trilliums but I began too late in life; besides, I understand you can't successfully cross-pollinate them anyway. But I've proved that you *can* grow them from seed.

From friends and friendly seedsmen I've had seed of wildlings from many distant states and foreign lands. Some years ago I saw a colored picture of *Podophyllum emodi* in the *Illustrated London News.* It has a waxy pink blossom which peeps up from between the pair of umbrellaed leaves. I wanted to grow it. At last my friend, Rex Pearce of Moorestown, New Jersey, got some seed for me from the Himalayan Mountains, its native home. Today I have six little seedlings of this, the only species of the genus other than our native *P. peltatum.* They are now five years old, but alas, show no signs of blossoms as yet.

Seeds of wild flowers listed by seedsmen are as various in the duration of their viability as are the seeds of garden vegetables or common garden flowers. While some fail to grow unless sown rather promptly after ripening, others retain their viability for a year or more. I usually sow my purchased wild-flower seed in flats during January or February, put them out on the north side of my garage and cover them with snow. Those which fail to come up in the spring I regard as old seed or seed which should have been sown immediately after it ripened and I try again. Each

species of plant has its own seeding peculiarities and one can only succeed by studying each one and trying to approximate its natural seeding habits.

Several California annual wild flowers have become established in my garden, seeding themselves freely. Baby blue-eyes, *Nemophila maculata,* pops up every June here and there about the garden since I sowed it several years ago. *Phacelia Whitlavia* is another California gem that pleases me.

A lovely biennial from our West Coast is *Coreopsis Atkinsoniana.* My colleague, Dr. W. C. Muenscher, brought me the seed from the wild some years ago. I like it best of all the *Coreopsis* species I have grown. It has made itself right at home in my garden, its seedlings coming up late every autumn "thick as hair on a dog's back" about every plant that I left for flowers the preceding spring.

A convenient way of storing wild-flower seeds which are short-lived when kept in packets is to stratify them as you gather them. That is, sprinkle them over layers of sand or a sifted sand-compost mixture in flower pots. Expose the open pots to the weather in a shaded spot. Then in the fall or winter sift out the seeds or sow them sand and all in the flats.

The soil for my seed flats consists of finely sifted compost, two parts, and sharp river sand, one part. I make my own compost by piling together during the spring and summer everything from yard, garden and kitchen that will rot. Fork it over once and it is ready for coarse sifting the next spring. Then as I resift it through a finer-meshed screen I put in the sand. I then disinfect it with chloropicrin (tear gas). This not only kills all pathogenic bacteria, fungi and insects, but devitalizes weed seed as well. This makes a mixture very like the forest soil in which many wild flowers grow.

If you have never grown wild flowers from seed try it this autumn. You get better plants, more of them at little or no cost and then there's the fun of it. You can't buy *that* even at 35c per plant.

THE CYCADS AND THEIR SO-CALLED FLOWERS AND FRUITS

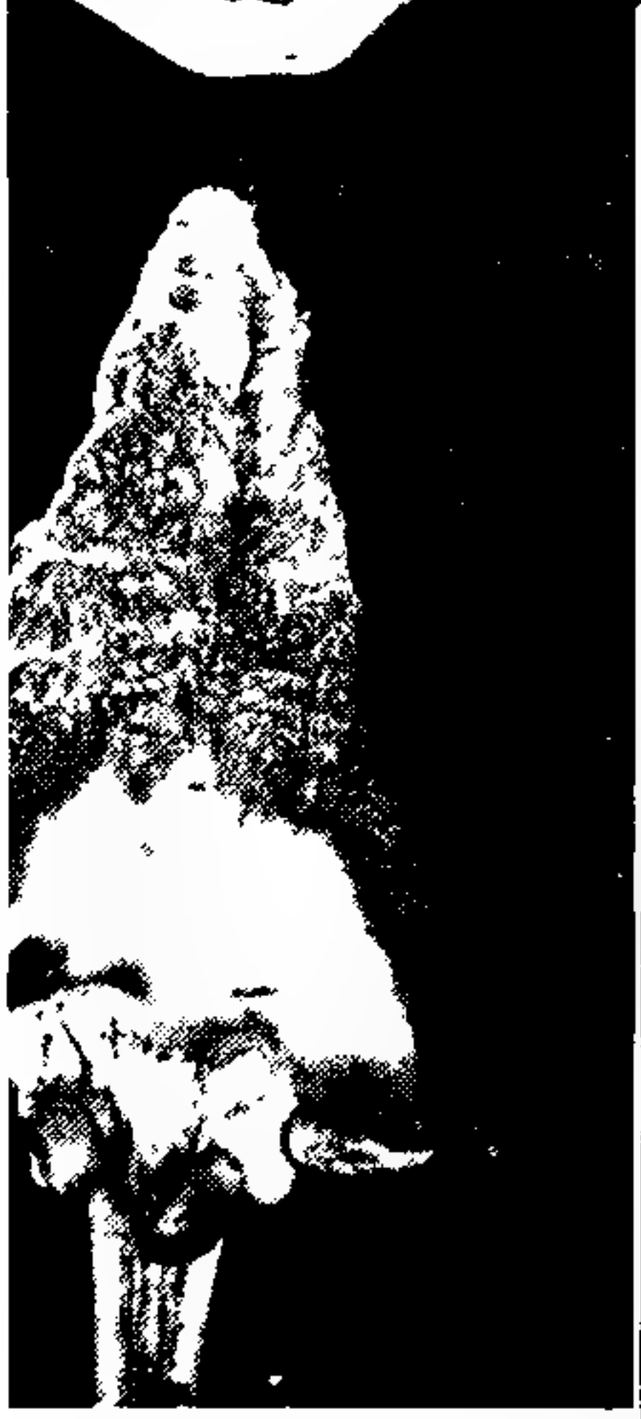
In general appearance the cycads somewhat resemble tree ferns (except that their leaves are more leathery), and they are indeed descended from seed-bearing fern-like plants which lived long ago during the coal-forming ages. These in turn were related to the primitive ferns from which our modern species have developed.

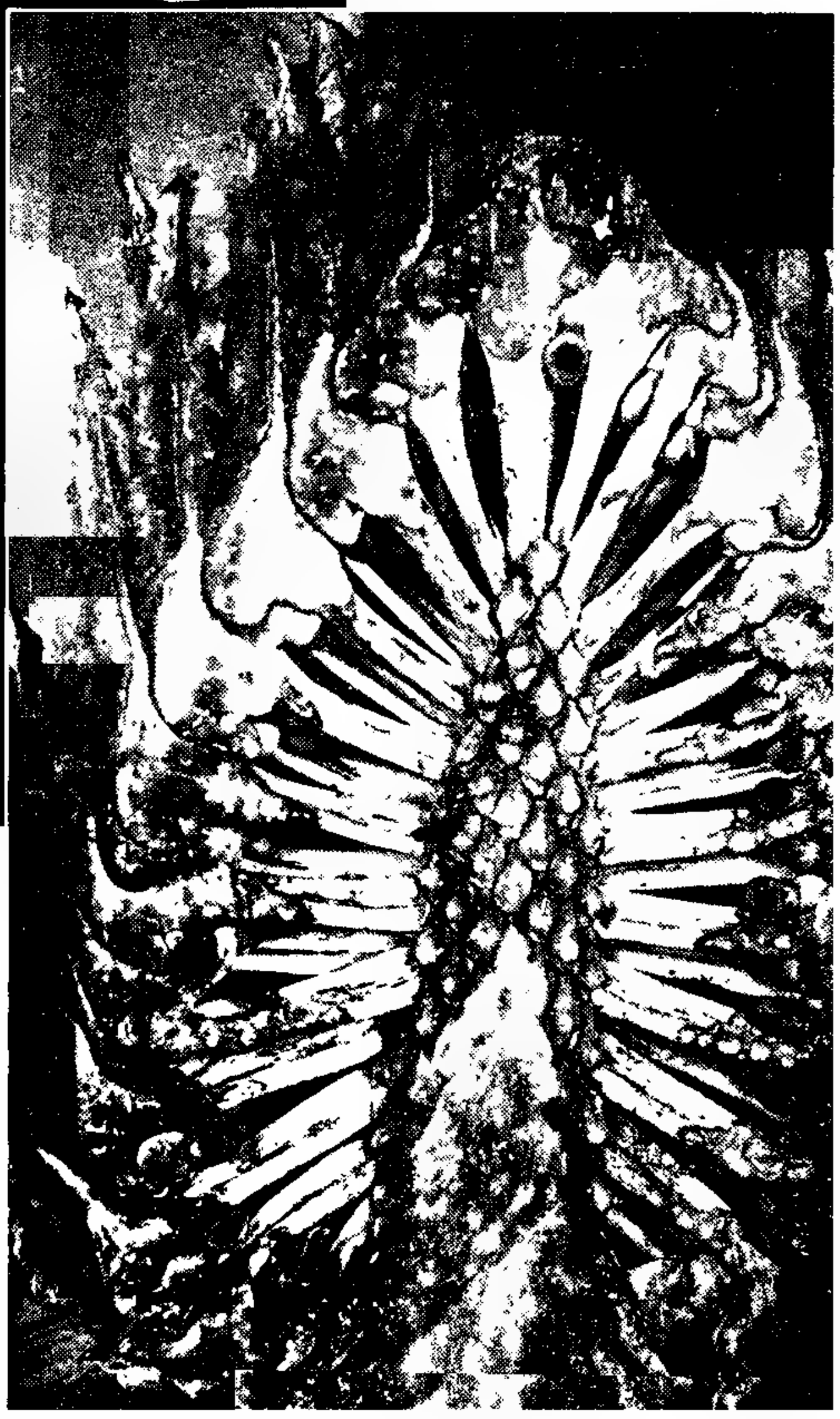
The huge seeds of cycads resemble small plums. They are not, however, botanically similar to the fruits of a true flowering plant. Each develops from an ovule and is comparable in origin and structure to the seed *within* the stone of a plum, or to a single pea. They are attached to the *edges* of leaf-like or scale-like parts, each of which is a *carpel,* whereas the seeds of flowering plants are attached to the *inner surface* of a fruit which completely encloses them.

In *Cycas revoluta* (shown below), each carpel (left) is pinnately parted into narrow lobes which resemble the segments of the leaves in arrangement, the ovules replacing the lower lobes. The whole cluster bears a remote resemblance to a flower In *C circinalis* (at the bottom of the opposite page), the lobes are reduced to teeth and the carpels, which are less leaf-like, are gathered into a more compact structure. In *Zamia* (above on the opposite page) and in *Dion* (on the two pages following) these tendencies are still more marked; the seed-bearing "leaf" or carpel becomes a long-stalked scale and the loose "flower" a firm cone.

Above· The female cone of *Zamia silvicol* shown dissected at the right.

Below The cluster of seed-bearing leave or carpels, in *Cycas circinalis*, a carpel bearin





(*Continued from the two preceding pages.*)

In the photograph opposite, showing *Dion edule*, a characteristic difference between the ferns and the cycads is revealed in the young leaves, which in the cycads do not uncoil in the fiddle-head fashion of the ferns. Instead, each pinna unrolls outward from the midrib.

Above are some detached seed-bearing scales taken from the cone of *Dion edule* at the right, which has been split lengthwise to show the structure.

Photographs by
Theodor Philipp Haas

Keeping Garden Flowers Fresh

Some Suggestions for the Preservation of Material Cut for Exhibit or Home Decoration

By Mrs. H. A. Jennison
Little York and Brooklyn, N. Y.

GARDEN flowers being picked for home bouquets as well as for shows where prizes will reward successful exhibitors have an obstinate habit of wilting at the crucial moment, whether it is guests or judges who are just arriving.

Many are the suggestions that have been offered here and there by gardeners and exhibitors for the preservation of cut flowers. The list below was compiled as a result of the experiences of judges in the Sixth District of the New York State Federation of Garden Clubs, Inc. While each method suggested has been successfully used by some of the judges in the District, none has yet been tested scientifically; that is, with other methods used at the same time as checks to prove the comparative value of the treatment. These methods are offered here, therefore, merely as suggestions for exhibitors and also for gardeners making bouquets and arrangements for indoor decoration.

The author, who can be addressed at the New York Botanical Garden, where she is doing volunteer work in the Library, would be grateful for reports from readers on these or other methods found effective in keeping garden flowers fresh after cutting.

Artemisia, also **Astilbe.** Cut in full bloom, for buds wilt quickly.

Asters. Cut when two-thirds of rays are fully expanded. Asters are in good condition when outer rays have not shadowed. Add one teaspoon of sugar to each quart of water to double the lasting qualities. Do not leave foliage under water for it rots quickly.

Blackeyed Susans. Pull flower stalks from main stem while in sun.

Calendulas. Cut when one-half to two-thirds of the rays are fully expanded. The stems collect slime on them after standing in water a short time. Plunge into a hot bath. The heat acts as a stimulant and seems to hurry the process of absorption and frees the stems of slime.

California Poppies. Gather in tight bud and allow to develop in jars of water in the house.

Calla Lilies.* Immerse leaves twelve hours under water. They will absorb moisture and stand up stiff and strong the next day. Protect flowers in packing by laying each one on a leaf.

Carnations. Flowers will last longer if two teaspoons of boric acid powder are added to a quart of water.

Chrysanthemums. Cut in full bloom. They will keep a week or ten days if one-quarter of a cup of sugar is added to each quart of water.

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* A few florists' flowers and a fern are included here because of the frequency of their use in arrangements and bouquets.

Dahlias. The large-flowered kinds should be cut when three-quarters of the rays have fully expanded. The flowers should be protected in the open. The pompon and single varieties should be cut when fully opened. Dahlias last longer when the stems are scalded in hot water as soon as cut. Remove lower leaves as they water-log and turn black.

Delphiniums. Cut spike when one-half to two-thirds of its length is open. Pick the flowers in the evening and be careful not to bruise them. Put the ends in good hot water until bubbles cease to come out of hollow stems and then place stalks in cold water over night. When packing, the stalks should be tied to long sticks and a little ice placed near them.

Gardenias. These flowers do not absorb water through the stems, so they are best preserved in ice-boxes, after sprinkling the blossoms and leaves with water.

Gladioli. Spikes of most varieties may be cut when three flowers are fully opened, though on certain kinds as many as six flowers may be open. One must know the variety in order to know when the spike may safely be exhibited without the first flowers commencing to wilt.

Hollyhocks. They make excellent cut flowers if the stems are given the hot water treatment and then dipped in a solution of one-tenth of one percent of nitric acid. They will then last a week.

Hyacinths. Being thick-petaled, they may be completely immersed in cold water, which will make them stand up straight They can also be wrapped in wet newspapers to keep the stems stiff.

Iris. Cut when the buds are just beginning to open.

Lilacs. Peel the bark from the stems for a short distance from the cut end, or crush the base of each stem. Remove some of the leaves from around the flower clusters.

Lupines. Cut early in the morning and put in deep water. Remove broken leaves for they will wilt quickly. However, leaves pulled from the stems are found to keep well.

Maidenhair Ferns. These will keep longer if some of the leaves of each frond are kept beneath the water line.

Marigolds. Cut when all but the inner rays are expanded.

Morning Glories. Cut while in tight bud and allow to develop in a jar of water in the house.

Pansies. These will last longer if arranged in shallow bowls with wet sand.

Peonies. Cut before the sun gets on the flowers, when three-fourths of the petals are fully expanded. Remove some of the larger leaves and slit the stem at the base. Or cut when the buds first begin to show color and become just a bit loose to the touch. Put in deep water and leave in a dark cool place for a couple of days to develop slowly.

Petunias. Cut when one or two flowers are fully open on each stem.

Phlox. The night before cutting pour a pail of water around the roots of the plants. This will keep the petals from falling the next day.

Poppies. Carry boiling water in a thermos jug into garden and plunge poppies into it as soon as cut; or, cut when freshly opened and put cut stems in a coal fire until ends are charred; or, cut the evening before they open. Place a few drops of liquid gelatin or luke-warm paraffin in the heart of each flower when it opens.

Regal Lilies. Cut when one-third to one-half of the flower is open or try cutting before the bud fully opens. If permissible, stamens may be removed to prevent pollination, which causes the flowers to wilt.

Roses. For buds, cut when petals start to unfurl and place twelve to eighteen hours in storage to harden. For flowers, cut when buds are one-half open. To pack, roll up tissue paper to form a pillow; lay flower on pillow and put stems in wet sphagnum moss. Roses may be revived by floating them in a bathtub of tepid water, covered with newspapers to conserve moisture.

Rudbeckias. Pull flowers from main stalks in sunshine.

Scabiosas. Cut when three-fourths of flower is opened.

Snapdragons. Cut when spike is one-quarter to one-half open at base with the rest in bud, for lower blooms often brown otherwise. For slime on stems, treat the same as calendulas.

Sunflowers. Pull flower stalks from main stem. They seem to keep better if this is done while the sun is on them.

Syringas. Pick before sun reaches them and crush the base of each stem.

Tulips. Give them the same treatment described above for hyacinths.

Violets. Hold bunch upside down and let water run through it gently to freshen it. Roll in wax paper to exclude air and put in a cool place.

Waterlilies. To keep flowers open have some paraffin just hot enough to flow. Place a drop of paraffin underneath each petal in every row and also in the center.

Zinnias. Cut the large zinnias when three-fourths of the rays are fully expanded; pompons and singles when fully opened.

Some additional suggestions for keeping cut flowers fresh are:

To keep water sweet and clean add a piece of charcoal or a few drops of formalin to a quart of water; or stir one-eighth of an ounce of potassium permanganate into a gallon of water.

To open buds quickly, place stems in a deep water container in a warm humid atmosphere.

Adding one-half teaspoon of peppermint extract to a quart of water is a simpler way to preserve many kinds of flowers than the boiling or burning method.

Split or crush a woody stem three inches up from the bottom to enlarge the surface in contact with the water. Then plunge in deep cool water and keep over night, cutting off the bruised ends in the morning.

Remove all foliage leaves and buds under water. Cut stems slantwise to expose more cell tissue to the water.

To remove bordeaux stains from foliage wipe off either with clear water or with one tablespoon of vinegar added to a quart of water.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Bacteriology for the Layman

THE MICROBE'S CHALLENGE. Frederick Eberson. 354 pages with glossary, index and bibliography. Jaques Cattell Press, Lancaster, Pa., 1941. $3 50.

This is a solid and authoritative piece of work by a pathologist who is Director of Laboratories in the Gallinger Hospital, Washington, D. C. The book covers a wide range of topics from ultra-microscopic viruses to plague, sleeping sickness and trichina. The difficulties, dangers, unsolved problems and successes of research men are well presented in a clear and interesting but not jazzy manner. The stories of the research which led to our understanding of some of the

deadliest human parasites are retold effectively. It is the sort of presentation that will appeal to the intelligent layman as an up-to-date and reasonably complete picture of our knowledge of our microscopic enemies. Medical students about to study bacteriology and doctors who are not specialists should find it worth reading.

Much of this material has been presented again and again in books and magazine articles but it seems to the reviewer that this is a more systematic treatment than one usually sees. I have enjoyed the book and would like to read parts of it again. The chief omission I notice is an account of the miracles of healing brought about by the sulpha drugs which are so deadly to some of the microbes mentioned in the book.

RALPH R. STEWART.

Challenging Chapters on Conservation

THE FOUNDATIONS OF CONSERVATION EDUCATION. Henry B. Ward, Editor. 242 pages, illustrated. National Wildlife Federation, Washington, D. C. 1941. $1.

A basic text admirably designed for the instruction of teachers who either must or should present the problems and the significance of conservation to their pupils. It is, however, scarcely a volume for the immature reader. The content, consisting of chapters written by leading authorities in the field, is both provocative and challenging; this volume should be of extreme interest to each person who is at all interested both in the natural world around him and in the welfare of his own and succeeding generations. The price is considerably below production cost, and copies may be obtained from the Washington office of the Federation at 1212 Sixteenth St. N.W.

CHARLES L. GILLY.

Vegetable Growing In The South

MASSEY'S GARDEN BOOK FOR THE SOUTHERN STATES. W. F Massey Revised by L. A Niven. 114 pages, with index and tables Progressive Farmer Ruralist Co., Raleigh, Birmingham, Memphis, Dallas, 1941. 25 cents.

This excellent handbook on vegetable growing in the South gives full, explicit, and accurate directions for maintaining a garden that is productive the year around. The author grows vegetables himself and tells all the tricks with a rare directness. Northerners do well to get half as much for twice the price.

FRANK G. MACKANESS,
Dillard University.

Amaryllis Year Book

HERBERTIA, Volume 8 Edited by Hamilton P. Traub. 186 pages, illustrated. The American Amaryllis Society, Orlando, Florida. 1942.

The 1941 annual of the American Amaryllis Society (Vol. 8) is a Daylily number, and contains a report by Dr. A. B. Stout on his interspecific hybridizations in *Hemerocallis,* also a note with three full-page plates concerning his proposed folio volume on *Hemerocallis.*

Reports from daylily growers in several parts of the country are printed and biographies of some of the pioneers are given.

Among other genera treated in this volume are *Narcissus, Haemanthus, Nerine, Hesperocallis, Clivia, Alstroemeria, Crinum, Leucocrinum,* and *Nothoscordum.*

The foreword is by Dr. Stout, the introduction by L. H. Bailey, who says in part: "There are abiding satisfactions in the growing of plants, that depend for existence on the land and the factors common to all mankind and are not disturbed by the conflicts of men. . . . We must maintain our interest in the growing of plants for the certain joy and confidence of the work."

CAROL H. WOODWARD.

Standard Practical Text On Insects Revised

APPLIED ENTOMOLOGY. An Introductory Textbook of Insects in Their Relation to Man. H. T. Fernald and Harold H. Shepard. Pages I—IX, 1-400; 383 text illustrations, index. McGraw-Hill, New York and London. Fourth edition, 1942. $3.75.

This revision of Dr. Fernald's Applied Entomology, a standard text since 1921, is a highly desirable addition to entomological literature. Applied or economic entomology is a rapidly growing science, and the seven years since the appearance of the third edition have witnessed marked advances in our knowledge of insects and control methods which fully justify the revision.

The same general plan has been followed as in the earlier editions, the book being literally an introductory text with special reference to the practical or economic phases. The student has in this work an excellent guide to the various groups of insects, the representative species selected for discussion and illustration being the more common or the more noteworthy because of their injurious habits. This arrangement brings the accounts of related insects in the same chapter. It is relatively easy for the individual interested in the injurious or economic phases to locate the desired information in relation to the many species affecting farm crops, gardens, shade trees and woody ornamentals, and animal welfare as well as that of man.

The conservative position of the authors in regard to the newer insecticides is commendable. This book will be used by many students and should be on the shelves of libraries and of working entomologists throughout the country.

E. P. Felt, *Director*
Bartlett Tree Research Institute.

Background in Geology

AN INTRODUCTION TO HISTORICAL GEOLOGY. William J. Miller. 499 pages illustrated, indexed. D Van Nostrand Co, Inc, New York. Fifth edition, 1942. $3.50.

A well illustrated exposition of past geological events, arranged in the usual chronological order, with some suggestion of their significance in the world of today. Neither overburdened with minutiae, nor yet completely skeletal, this volume will provide the student with basic knowledge of the subject. Emphasis, as in most comparable texts, is upon North America.

From the standpoint of students throughout this country it is somewhat unfortunate that numerous of the important episodes in the geological story are related from the restricted viewpoint of a single or a few contiguous localities —especially when these particular events were of much wider geographical significance. The story of Pleistocene glaciation is oversimplified; in this, as in other phases of the subject, it appears that the author of this text has given all too little consideration to the more recent publications dealing with particular aspects of the problems with which he dealt.

Charles L. Gilly.

Picture Books Concerning Trees

KNOWING YOUR TREES. G. H. Collingwood. 213 folio pages, illustrated, indexed. American Forestry Association, Washington, D. C., 1941 $2.50.

The fifth printing of this book, prepared from material which has appeared in *American Forests* magazine, is a revised edition containing double the number of trees that were treated in the original. While there are still a few important trees of North America that are missing, the book gives abundant information about nearly 100 of them, and for each species described there is a photograph of the tree, usually both in winter and in summer condition, also photographs of the leaves, flowers, buds, fruits, and bark, besides a distributional map showing the natural range.

AMERICAN TREES. Russell T. Limbach 39 folio pages, illustrated by the author, indexed, Random House, New York, 1942. $1

Marginal drawings which show in clear detail the leaves and fruits and occasionally the flowers of more than 50 common trees of North America help to increase the reader's familiarity with the elms, oaks, maples, birches, and numerous other trees described. There are a dozen pages, including endpapers, showing full-grown trees in garish colors. An introduction by T. H. Everett urges a knowledge of trees as a background for "friendships with some of mankind's oldest benefactors."

TREES. John Y. Beaty 96 folio pages, illustrated, M A Donohue & Co, Chicago & New York, 1942. $1.50.

As a result of guiding many children on trips into parks and woodlands where they could study trees at close range, Mr. Beaty has written this book in which two small boys are taken to the western woods and encouraged to observe and ask questions about the trees as they go.

TREES OF THE COUNTRYSIDE. Margaret McKenny. 62 pages, indexed and illustrated. Alfred A. Knopf Co, New York, 1942. $2.

Full-page color lithographs by Alice Bird, showing 29 trees, with drawings of flowers, fruit, and leaves of each, are combined with a text which gives an interesting personality to each tree, as well as a number of entertaining facts about its growth and its uses.

Preserving Our Natural Resources

AMERICAN CONSERVATION In Picture and In Story. Ovid Butler. 160 folio pages, with 254 illustrations. The American Forestry Association, Washington, D. C., 1941. $2 50.

Photographs, a few historic drawings, and a text which shows an exceptional grasp of every phase of the subject tell, without circumlocution, a dramatic story of the history of the conservation movement in America, its development, and the results which can be foreseen for the future if the forces now at work can be continued. The compiler and editor has for many years been the editor of *American Forests* magazine and Executive Secretary of the American Forestry Association, which was responsible through the American Forest Congress, called in 1905, for the transfer of the country's Forest Reserves to the Department of Agriculture, a move which resulted in the Forest Service and in the designation and development of the reserves as National Forests.

CONSERVATION. Boy Scouts of America. New York, 1942.

Nature's balance and what happens when it is upset are pictured in this booklet for Boy Scouts. The text suggests various conservation projects which will help to preserve or restore this balance, and which at the same time will win merit badges for the Scouts.

For Teachers and Other Leaders

ELEMENTARY GARDEN GRAPHS. Paul R. Young 8 folio pages, illustrated by J. Dean Halliday Garden Reviews, Inc., Pleasantville, N. Y. 1942. 50c

Accompanied by a teacher's manual, which is sent free with every 25 copies (for which the price becomes 40 cents apiece), this booklet by the Supervisor of School Gardening in Cleveland, Ohio, outlines eight practical lessons in gardening for school children.

CAMPING, a bibliography. Harriet L Carter. 46 pages, bound in paper. Chicago Public Library, Chicago. 1942. 40c.

A list of about 300 titles of books for camp directors and counselors, including woodcraft, Indian lore, nature study from sea to sky, handicraft, and games and sports.

Words

DICTIONARY OF SCIENTIFIC TERMS. C M Beadnell. 235 pages Chemical Publishing Co, Brooklyn. 1939. $3.

A handbook which frequently gives, in addition to mere definitions, a descriptive paragraph on the structure or use of the object or material.

For the Juvenile Shelf

OUT OF DOORS IN SPRING. C J Hylander. 143 pages, illustrated with drawings and photographs by the author The Macmillan Co, New York, 1942 $1.50.

The common flowers of spring, the frogs and other familiar amphibians, butterflies, birds, ferns, and a few lower forms of life are depicted in a style that is intended for young people. But they must not be so young that they will become discouraged in Chapter I by the explanation of reproduction in which the author says that "every plant and animal has an inherited ability to leave behind itself other plants and animals of a similar kind."

OUT OF DOORS IN SUMMER. C J Hylander 142 pages, illustrated, indexed. The Macmillan Co, New York, 1942. $1.50.

In this, the second of Mr. Hylander's books of the four seasons, the young person who can grasp a word like *chlorophyll* and who understands what carbon, oxygen, and hydrogen are, has the opportunity to get several years ahead of his classmates through learning about the process by which green leaves manufacture food in the presence of sunlight. Various kinds of tree leaves, summer flowers, mushrooms, and native animals are treated in this book.

BOY OF THE WOODS. Maje Lounsbury Wells and Dorothy Fox. 142 pages, illustrated, E. P. Dutton & Co., Inc, New York, 1942 $2.

The ever-entrancing story of Audubon is told, with emphasis on his youth, for boys and girls up to 12 years of age. Wash drawings by Elinore Blaisdell add vividness to the picture of the pioneer life that was Audubon's.

COCONUT—THE WONDER TREE. Armstrong Sperry. Illustrated in color. The Macmillan Co, New York, 1942 $1.

An appealing story for very small children, illustrated by the author with

drawings in color showing home life in the South Sea Islands.

BAMBOO—THE GRASS TREE. Armstrong Sperry. Illustrated in color. The Macmillan Co., New York, 1942. $1.

Bird cages and bridges and many other objects are made of bamboo in China, and the author tells an entertaining tale of a little Chinese boy who made a bird cage, for very little American boys and girls to read.

EXPLORATION OF THE JUNGLE. Jo Besse McElveen Waldeck 56 pages, illustrated D C Heath & Co, New York, 1942 40c.

One of a series of books for children designed to give a picture of the lands that lie to the south of us in the Americas. A factual little volume written by a woman explorer, attractively illustrated with jungle scenes and maps.

Butterflies and Other Insects

AMERICAN BUTTERFLIES AND MOTHS. Cecile Hulse Matschat 70 folio pages, illustrated in color, indexed Random House, New York, 1942. $1

An instructive book, so far as it goes, with many illustrations both in color and in black and white by Rudolf Freund, who uses plants effectively as a background for these lepidopterous insects. About two score butterflies and nearly as many moths are treated.

INSECTS AND THEIR WAYS. Bertha Morris Parker 36 pages, illustrated by Elizabeth Newhall. Harper & Bros., New York, 1942. $1.

This is one of the many books by Bertha Morris Parker, all as authentic as they are entertaining and instructive, and all pleasingly illustrated in color.

Pamphlets on Outdoor Careers

JOBS IN THE FORESTS OF THE PACIFIC NORTHWEST. Donald Nylen and John Rule. 78 pages, paper-covered Northwest Regional Council, Portland, Oregon, 1941. 50c.

This book introduces the men who work in the forests and makes the reader acquainted with their various types of jobs and opportunities. The three appendices list jobs in the forests and tell what they pay, describe ways of making money for oneself in the northwestern forests, and give a list of books under the heading, "Interesting Readings About Forests and Forest Jobs."

CAREERS IN WILDLIFE MANAGEMENT. Charles N. Elliott. 48 pages, paper covered, with bibliography. Science Research Associates, Chicago, 1942. 60c.

A chapter on the importance of wildlife to the citizens of America precedes the information given on private, state, and federal wildlife workers. Training required, education recommended, and wages offered for jobs in wildlife management are outlined. This is Occupational Monograph No. 29 in the American Job Series.

Scientific Record From The Magazines

SCIENCE YEAR BOOK OF 1942. Edited by John D Ratcliff. 279 pages, indexed. Doubleday, Doran, New York. 1942. $2 50.

Containing reprints of 1941 magazine articles pertaining to scientific advances and discoveries, this volume enables one effectively to catch up on a year's reading in chemistry, medicine, botany, and similar fields.

Of particular interest to readers whose chief concern is plant life are several articles on medicine, agriculture, and industry. One tells of the discovery of the geographical incidence of leprosy over the world showing direct relationship to taro being used as a principal food crop, the taro (also corn cockle and decaying fish) containing an injurious substance, sapotoxin. Another visualizes the devastating effect that the absence of birds in a single season would have upon crops, while another describes the new-found use of the kudzu-vine in the South to stop gullies, provide fodder, and add nitrogen to the soil.

Recent discoveries, through the X-ray microscope, of the effect of the angle of cellulose layers upon the strength of a cotton fibre promises to be the starting point for the development of new varieties which will provide more durable cotton, according to one of the authors. The development of a great rubber plantation in Brazil by Ford is described by a writer who visited the place, while another explains the value of earthworms in aerating and quickly enriching soil.

CAROL H. WOODWARD.

*Current Literature** *At a Glance*

Iris Varieties. As a supplement to the extensive list published in 1939, Ethel Anson S. Peckham has compiled an Iris Check List covering 67 pages in the July number of the Bulletin of the American Iris Society. Mrs. Peckham was also the compiler of the original list. The supplement, in which she has been assisted again by Charles E. F. Gersdorff, Registrar for the Society, includes "registrations, introductions, corrections, and additional varietal data from autumn 1939 to January 1942."

Surinam Plants. Under the title of "De Nuttige Planten van Suriname," Gerold Stahel has prepared a work of 200 pages which was published in August as Bulletin 57 of the Agricultural Experiment Station of this South American country. Fruits, vegetables, woody plants, and others that are the source of a great variety of products are among the "useful plants" that are treated descriptively and in lists, with a bibliography and index at the end.

New South Wales. "The Poison Plants of New South Wales" is a timely volume of 498 pages, compiled by Evelyn Hurst under the direction of the Poison Plants Committee of the University of Sydney and the N.S.W. Department of Agriculture. The plants are treated by families and an abundance of information is given on each. The bibliography covers 36 pages, and there is also a glossary and index. The book comes from the National Herbarium of New South Wales.

Pickaback. A writer from Minnesota, where the winter temperature often goes to 20 below zero, reports in the October *Flower Grower* magazine that she has kept her pickaback plant (*Tolmiea Menziesii*) successfully outdoors all winter long under a covering of leaves and that in the following spring it flowered for the first time. The leaves had remained green all winter beneath their blanket. This plant has also wintered successfully and bloomed in the Thompson Memorial Rock Garden.

*** All publications mentioned here—and many others—may be found in the Library of The Botanical Garden, in the Museum Building.**

Vegetables. Five cents mailed to the Superintendent of Documents in Washington, D. C., will bring a copy of "Victory Gardens," Miscellaneous Publication No. 483 of the U.S.D.A. Out of its 11 pages the prospective gardener will get some practical information on the why, how, what, and what not in the home culture of vegetables.

Propagation. Detailed instructions for the latest methods of propagation of more than 120 trees and shrubs are given by William L. Doran in Bulletin 382 of Massachusetts State College at Amherst, Mass.

The Camellia. George Graves of the Massachusetts Horticultural Society writes on the history of the camellia in the Oct. 1941 number of the *National Horticultural Magazine*, and appends a bibliography of 41 titles. Reprints of the paper have been distributed.

New Plants Described. An innovation among publications of nurseries is an extensive report put out late last year by the Wayside Gardens of Mentor, Ohio, on all the novelties that it was introducing in the spring of 1942. The report, which covers more than 50 pages and includes approximately 115 subjects, also treats a number of plants introduced during the past few years. Many were illustrated in color in the nursery's 1942 catalog.

Soil Story. A useful lesson on soils, what they consist of, what they need, how they are wasted away, and how they may be saved, is told in the *Cornell Rural School Leaflet* for Nov. 1941. Diagrams and photographs help to tell the story.

Conifers. Cuttings of Norway spruces which were stored over winter or taken in spring did not respond as well as cuttings started at other times of the year in experiments conducted by the Dominion Forest Service at Ottawa. The report is contained in the tenth of a series of articles on the vegetative propagation of conifers in the *Canadian Journal of Research.*

Healing Agent. Chlorophyll as a new healer is described by H. W. Gillary in *The Teaching Biologist* last November. The entire issue of this magazine, which is published by the New York Association of Biology Teachers, is devoted to articles on photosynthesis.

Orchid Problem. The solution to the problem of how *Coryanthes* is pollinated is still largely a matter of guess-work, according to Oakes Ames, writing in the *American Orchid Society Bulletin* last November. Dr. Ames shows photographs and drawings of the flower and advances a theory, but concludes with the hope that observers in the tropical home of this orchid will furnish more definite facts than can be obtained in a greenhouse or laboratory.

Notes, News, and Comment

From Hawaii. Otto Degener, who has not been in New York since 1935, arrived Sept. 14 at the Botanical Garden, where he plans to work on his Hawaiian plant collections. With him is LeRoy Peiler, a Hawaiian boy of 13, who is now going to school in New York City. They left Honolulu on the Clipper in May and made a collecting trip across the country during the summer. In 1941 Mr. Degener was a member of the Archbold expedition to Fiji and surrounding islands.

Student. Mrs. Annette Harvey, graduate student in botany at Columbia, is working this fall in Dr. Robbins' laboratory in preparation for the degree of Doctor of Philosophy.

Visitors. Among September visitors at the New York Botanical Garden were Mr. & Mrs. Robert T. Clausen from Cornell University; Leon Croizat, Arnold Arboretum; Egbert H. Walker, Smithsonian Institute, Marcelle Gauvreau, Montreal Botanical Garden; Gertrude E. Douglas, State Teachers' College at Albany; John C. Wister, Philadelphia; Antoinette Miele, Cornell; W. A. Knight, St. Augustine, Fla.; W. Stephen Thomas, Dobbs Ferry, N. Y.; Walter H. Snell, Brown University; H. M. Fitzpatrick, Cornell; and Frederic P. Lee, Bethesda, Md

Courses. Dr. R. R. Stewart is teaching the class in Ecology and Plant Geography in the Two-Year Science Course for Professional Gardeners, in place of John H. Pierce. Twenty-two students are registered for this subject, as well as for Dr. B. O. Dodge's class in Plant Pathology. Forty students have enrolled for the class in Cultivation of Trees and Shrubs in the Two-Year Course in Practical Gardening, being taught by J. H. Beale of the Boyce Thompson Institute. A dozen are registered in Planting the Home Grounds, taught by P. J. van Melle. The Saturday class in Field Botany, under G. L. Wittrock, has an enrolment of ten.

Lectures. Dr. F. J. Seaver spoke on Bermuda Oct. 4 at International House before the New York chapter of the Science Society of China. Dr. Roberta Ma addressed the Woman's Club of Ashland, Pa., Oct. 1 on "Women in China."

Plant Distribution. Members were notified the last of September that on Oct. 7 or 8 those who wished them would be able to receive two plants each of *Heuchera Pruhoniciana* and *Ilex crenata Helleri.* The former is a hardy perennial coral-bell which has been attracting attention for several years in the Thompson Memorial Rock Garden. The latter is a handsome evergreen holly of cushion-like growth.

Daylily Party. To honor Mrs. Theron G. Strong, who is a member of the Advisory Council of the New York Botanical Garden, the Garden Club of East Hampton, of which Mrs. Strong is a founder, gave a "tribute party" July 16. The occasion was the first flowering in the Clinton Academy garden of the large collection of *Hemerocallis* which Mrs. Strong had presented to the Garden Club when she sold her home, "The Dolphins," at East Hampton last year. Mrs. Strong's collection included the majority of the hybrids that have been developed at the New York Botanical Garden, among them the deep red daylily ***Theron,*** which was named in memory of her son. Dr. A. B. Stout sent many specimens of daylilies cut from the trial grounds at the Garden for a special display. Daylilies were also included in the flower arrangements which formed part of the decoration for the affair. One of the speakers was Mrs. Samuel Seabury, who is also a member of the Garden's Advisory Council.

Appointment. F. Truman Fossum, a former student gardener at the Botanical Garden, has joined the staff of the department of horticulture at the University of Maryland for a combination of teaching, extension work, and graduate study.

THE NEW YORK BOTANICAL GARDEN

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A. C. PFANDER	*Assistant Superintendent*

To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

Blvd., the Third Avenue Elevated to the Bron
to the Botanical Garden station; or drive up t

MEMBERSHIP IN THE GARDEN

Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests. Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public.

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia once a year, each number illustrated with eight colored plates of unusual plants, accompanied by descriptions.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

(4) Announcements of special floral displays, programs, lectures, and other events at the Garden.

(5) Credit to the amount of the membership fee paid, toward courses of study offered by the Garden.

(6) The privilege of borrowing lantern slides from the Garden's collection.

(7) Use of the Members' Room in the Museum Building.

A limited number of garden clubs are accepted as Affiliates. The privileges of affiliation are one lecture a year by a member of the staff, a share in the distribution of plants when they are available, a subscription to the Journal and to Addisonia, and announcements of special activities at the Botanical Garden. In addition, any member of an affiliated club may receive for the current year of membership a reduction of $5 in the fees paid for instruction. (This does not apply to the course for professional gardeners.) An Affiliate Garden Club may borrow lantern slides from the Garden's extensive collection, such loan being subject to the regulations for the use of lantern slides by individual members. Likewise, an affiliate club may engage without fee the Members' Room at the Garden for its meetings.

The classes of membership are as follows:

Annual Member	annual fee	$ 10
Sustaining Member	annual fee	25
Garden Club Affiliation	annual fee for club	25
Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
Patron	single contribution	5,000
Benefactor	single contribution	25,000

Fellowships or scholarships for practical student-training in horticulture or for botanical research may be established by bequest or other benefaction either in perpetuity or for a definite period.

Contributions to the Garden may be deducted from taxable incomes. The following is a legally approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————————.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York, N. Y.

JOURNAL

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THE NEW YORK BOTANICAL GARDEN

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

DIVIDENDS FROM INVESTMENT IN SCIENCE

IN the corn belt of the Middle West the planting of new strains of hybrid corn is increasing the yield 18 percent per acre This means that while a normal amount is being produced, 18 percent of the land can be turned over to some other profitable crop, and this new crop is soybeans. In Iowa and Illinois alone, the increased profit for one year from such a practice is approximately $100,000,000. The hybrid corn which brings this result is exclusively the product of botanists.

This was one of the examples given by Dr. H. A. Gleason in his address on "Botany in the Service of the Public" on Members' Day at the Garden November 4.

Such profits, he pointed out, do not come from the work of a single man, but from the cumulative efforts of the botanists who have been doing research for the past 300 years Their results stem from such men as Camerarius, who determined the presence of sex in plants; from Robert Brown, who discovered the nucleus; from Hofmeister, whose studies settled the origin of the embryo in flowering plants, and from the Austrian monk, Gregor Mendel, who gave us our first scientific insight into heredity.

Dr. Gleason did not need to repeat the often told story of how a Columbia graduate, doing research at the New York Botanical Garden, conceived puffed rice and wheat as breakfast cereals when the rice in which he was studying starch grains exploded in his test tube. The oven which Dr Alexander P. Anderson was using at the time was sitting on a shelf beside the audience, giving silent emphasis to the speaker's remarks.

"Scientific facts are generally produced without regard to their practical application," Dr. Gleason said. "Eventually the threads of many can be drawn together to result in some useful economic practice"

It is the great body of people in the world who reap the final benefit from the scientific research which seems so remote from them while it is being performed. The business men, the farmers, the consumers of food and of manufactured products the citizens as a whole—are the ones who gain That is why federal, state, and city governments support scientific institutions. That is why scientific workers are accorded fellowships from funds set aside for social welfare. And that is why individuals should give as freely to institutions sponsoring scientific research as to organizations in which the benefits are more immediately seen.

As a member of society, each individual has a responsibility to the future of that society. A future worth living is best assured when science is given a chance The science which today most closely affects the food and medicine of tomorrow is the science of botany.

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JOURNAL
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THE NEW YORK BOTANICAL GARDEN

VOL. 43 NOVEMBER 1942 NO. 515

Early New York Seedsmen And Nurserymen

By Richardson Wright

As presented at the first Members' Day program at the Botanical Garden, October 7, 1942.

RATHER than try to penetrate the yeasty mists that hang over the veriest beginnings of gardening in New Amsterdam, let us take the British occupation as our starting point. The year, you'll remember, was 1664.

We shall have to sit quietly in our chairs for 66 years before we find that out in Flushing Robert Prince has established his nursery, and thus in 1730 began a horticultural dynasty destined to last until 1869. The activities of this nursery family will run like a silver thread through the tapestry we are about to weave.

We wait another nine years and pick up the *New York Journal* for February 19, 1739, to discover John Miller advertising seeds for sale.

"To be sold by John Miller, gardener of the old Bowling Green, several sorts of gardening seeds of the best sorts and fresh, at reasonable rates, and all sorts of Snuff, Pigtail and Cut Tobacco, at his house, next door to Samuel Heath's near the Fort in New York."

The following year Mr. Miller's advertisement locates him at the Sign of the Thistle and Crown near Bowling Green.

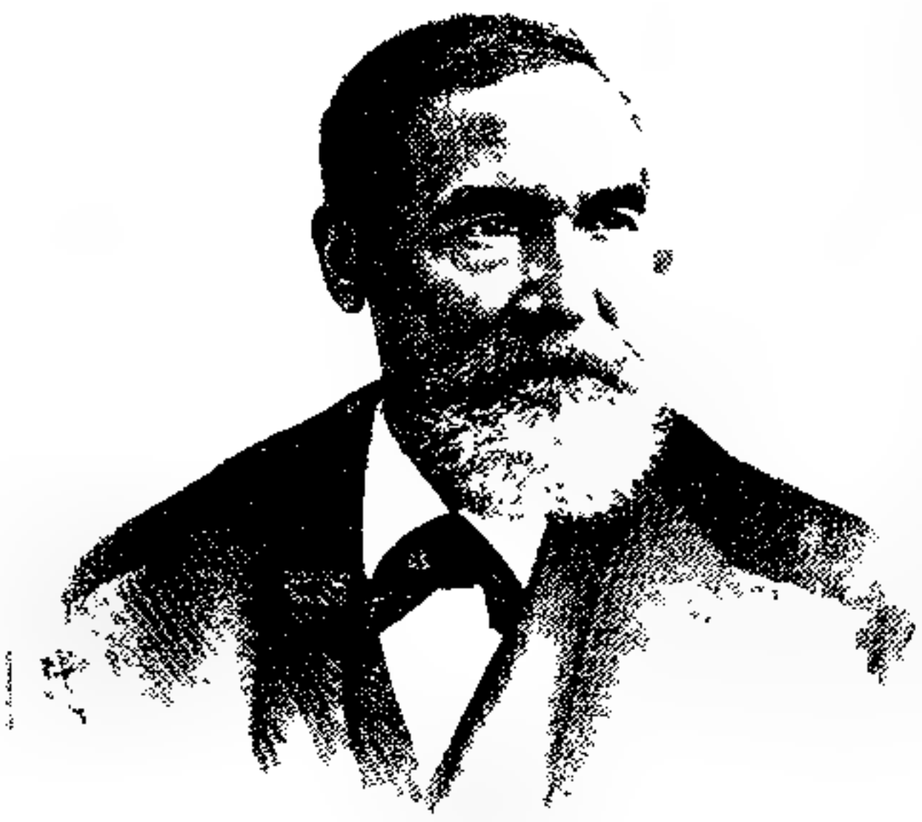
Then you and I wait thirteen more years until the *New York Post Boy* of February 3, 1752, reveals that Christopher Blundell, "next door to the Post Office," is advertising "imported vegetable and flower seeds for sale."

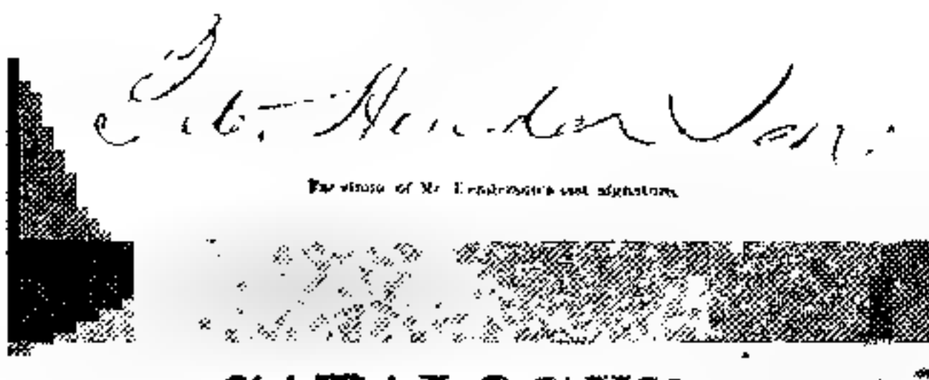
Eleven years pass and, in 1763, Thomas Young, over in Oyster Bay, is beginning his nursery for fruit trees.

Doubtless we could continue this search of the fragmentary newspapers, but we prefer to skip the short span of 34 years and dip into New York's first Directory, that of 1786. No seedsman or nurseryman is listed. There are a little over a thousand names in this first directory and New York's population totaled 23,614. The British had evacuated the city only two

SOME EARLY NURSERY CATALOGUE

and a famous nurseryman





For views of Mr. Prince's seat, signatures

CATALOGUE

FRUIT AND ORNAMENTAL

TREES AND PLANTS,

BULBOUS FLOWER ROOTS,

GREEN-HOUSE PLANTS, &c. &c.

CULTIVATED AT THE

LINNÆAN BOTANIC GARDEN,

WILLIAM PRINCE, PROPRIETOR.

Flushing, Long-Island, near New-York

TO WHICH IS ADDED,

A SHORT TREATISE

ON THEIR CULTIVATION, &c

TWENTY-FIRST EDITION.

NEW-YORK.

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1822.

OF

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HERB, FLOWER, TREE, AND GRASS

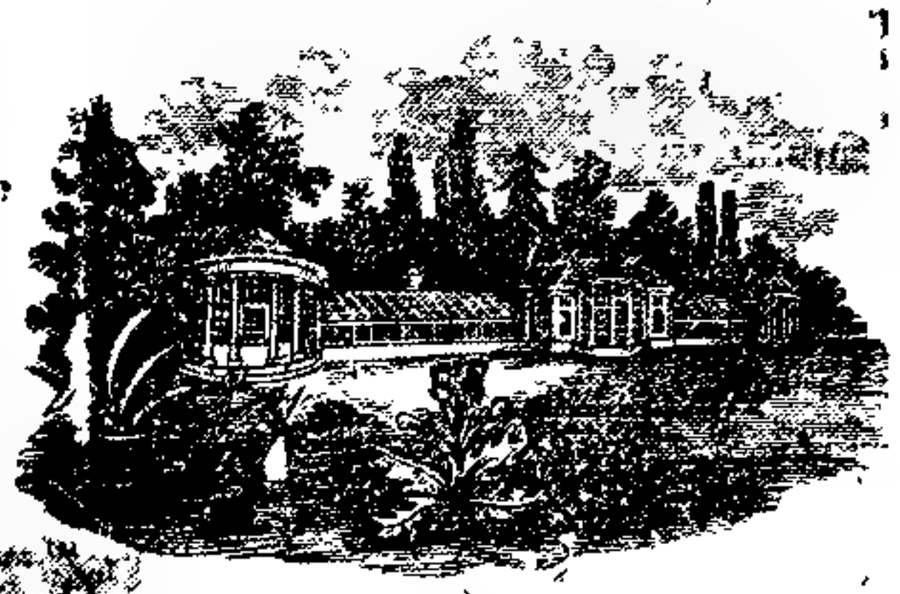
SEEDS,

BULBOUS FLOWER ROOTS,

GARDENING, AGRICULTURAL AND BOTANICAL

BOOKS,

GARDEN TOOLS, &c.



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Nurseryman and Florist,

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NEW-YORK.

PRESS OF G. P. SCOTT & CO. NASSAU-STREET

NEW-YORK

years before and conditions in New York were not yet supplying all the amenities of life.

Meantime, those Huguenot Princes had continued busy. A son William, born five years before his father started the nursery, took up the family profession and the nursery grew rapidly—especially in the culture of fruit trees—until the Revolution. Peace came at last; ruined and neglected orchards had to be restocked. The Princes were very busy. Their first catalog, filled with varieties of fruits, appeared in 1794. In 1783 they had introduced ***Prince's Yellow Gage*** and in 1794 the ***Imperial Gage*** – two of our early efforts to introduce new plum varieties. When this second proprietor died, his son Benjamin continued on in the same spot, called The Old American Nursery, whereas his son William started afresh on new land, calling his venture The Linnean Botanic Garden and Nursery, buying in 1793 eight more acres at Flushing. This happened about the beginning of the 19th century.

Our next lead is the New York Directory of 1815. I have carefully scanned all 466 pages and 17,400 names of this stout little volume and find that at the time New York had 53 gardeners (two of them women, by the way, widows), one nurseryman—James Steadman, at Livingston and Pitt Streets—and four seedsmen. They were: Michael Dennison, 105 Maiden Lane; A. Gentle, "Florist and Seedsman," 124 The Fly Market; Samuel Grundy, florist, 20 Nassau Street, and Grant Thorburn, seedsman and florist, 22 Nassau Street. From his location next door, I gather that Mr. Grundy was trying to compete with Mr. Thorburn.

Mr. Grundy and the others I shall leave in their obscurity.

The name of Grant Thorburn, however, is familiar to most of us. Born in Scotland in 1773, he early came to New York when he worked first as a wrought-nail maker, then he had a grocery and thread and needle shop in Nassau Street, near Liberty. Farmers coming to market in those days sold potted plants. In the fall of 1803, as he recounts in his "Forty Years' Residence in America," the young Thorburn hit on the idea of painting the pots green. His first four sold quickly, so he painted twelve more, and so his business started. He added to it some rose geraniums bought in the Fly Market at the foot of Maiden Lane. George Inglis, a Scotsman, grew the plants and Thorburn sold them. Next he added seeds which Inglis grew. By 1806 he was importing seeds from abroad, published a catalog, and wrote "The Gentleman and Gardener's Kalendar." His memoirs tell his life's story. Mr. Thorburn died in 1863, at the age of 90. F. W. Bruggerhof carried on the Thorburn business for a lifetime.

Meantime, William Prince, the third proprietor of the Linnean Botanic Garden and Nursery at Flushing, was introducing foreign trees and plants of merit, discovering unknown American species, and creating new hybrids. One of his introductions was the Lombardy poplar.

The catalogs of this nursery from 1815 to 1850, many of which are

displayed here today,[1] are among the most valuable of our early horticultural publications. In 1828 he wrote the "Treatise on Horticulture," the first work of the kind to be produced here.

Since the Directory of 1815 there have passed ten years—and now we turn to that of 1824-5. Here we find 31 gardeners and the following seedsmen and nurserymen:

William Agnew, tobacco and flower seed, 280 Front Street.
Thomas Bridgeman, florist, 332 Bowery. Later, 826 Broadway at 18th Street.
Anna A. Burr, florist, 83 Pearl Street.
Phoebe Flandran, florist, 243 William Street.
Michael Floy, nurseryman and seedsman, Broadway at 11th Street.
Andrew Gentle, seedsman, 118 Maiden Lane.
Alexander Smith & Sons, nurserymen, 371 Broadway.
Grant Thorburn & Sons, 20 Nassau Street. He has evidently come up in the world, because he lives away from his shop—at 41 Liberty Street.

Of Michael Floy we have heard recently through the diary of his son,[2] in which journeyings from the Broadway office to the nursery in Harlem for stock are set down. Evidently the elder Floy was especially interested in dahlias. He also turned attention to fruit and shade trees. The younger Floy, although working with his father, was apparently more interested in mathematics and religion than in horticulture.

Thomas Bridgeman had arrived from his native Berkshire only the previous year—1824. He is best remembered as the author of "The Young Gardener's Assistant," which appeared in many editions continually enlarged. This first work, published in 1829, appeared in 1847 as a large three-part work on fruit, vegetables and ornamental gardening. One part of it, "The Kitchen Gardener's Instructor," was republished as late as 1866—a commendably long life—37 years—for a gardening book. For many years the Bridgeman display garden was at 18th Street and Broadway. Mr. Bridgeman died in 1850 but his son Alfred continued the business on East 19th Street until within the memory of some present here today.

I wish I could tell you more of those two women florists of 1825—Anna A. Burr and Phoebe Flandran, but I'm afraid they will have to remain unsung. Another who piques my curiosity is Andrew Gentle, seedsman. In 1815 he was located in The Fly Market; ten years later, his business evidently prospering, he moved to Maiden Lane. The others, too, we shall leave sleeping and press on to consider an important nurseryman whose name does not appear in this New York Directory of 1824-5 -Thomas Hogg.

As you will see, by one of his catalogs on display here today, his

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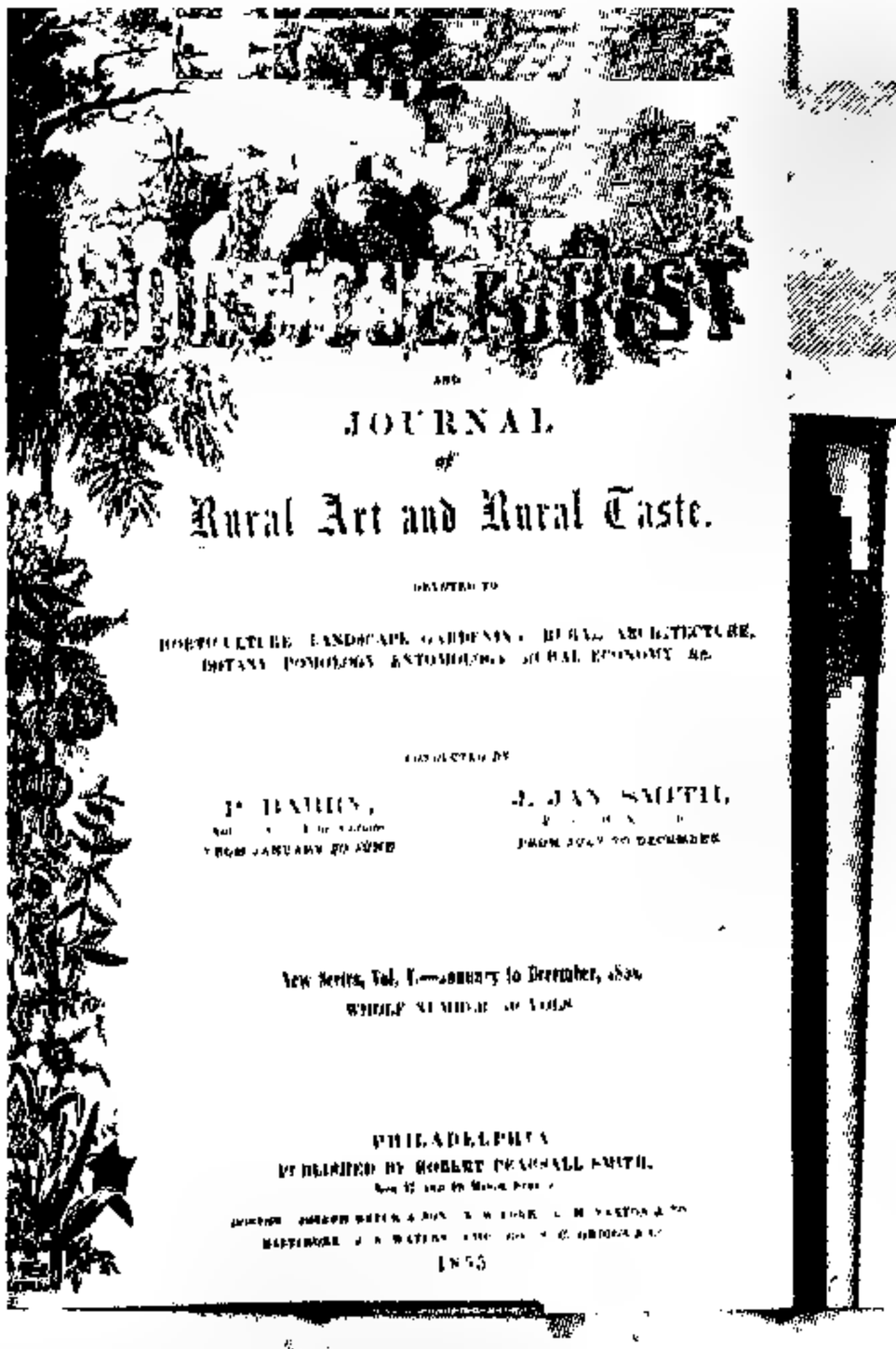
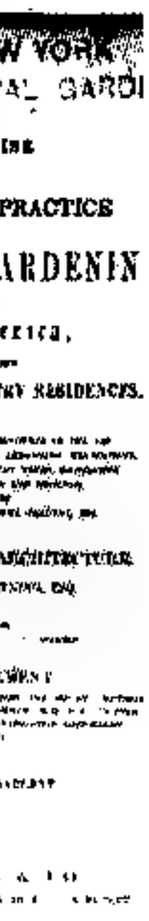
[1] About 75 early American horticultural works from the New York Botanical Garden's library, particularly those from the region of New York and published prior to 1850, were displayed during this Members' Day program.

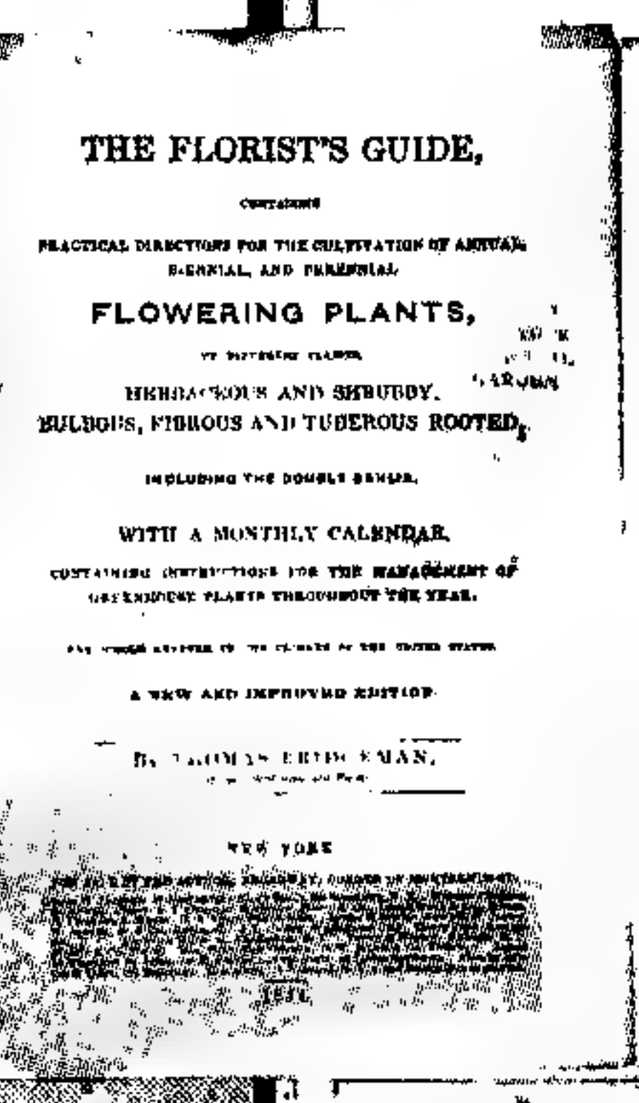
[2] Brooks, R. A. E., Editor. The Diary of Michael Floy, Jr. Bowery Village, 1833—1837 269 pages. Yale University Press. 1941. Reviewed in the Journal of the New York Botanical Garden, Feb. 1942.



NINETEENTH CENTURY HORTICULTURAL LITERATURE IN AMERICA

These works and their authors exerted a noteworthy influence on the development of horticulture and landscape gardening in the United States in the early days.

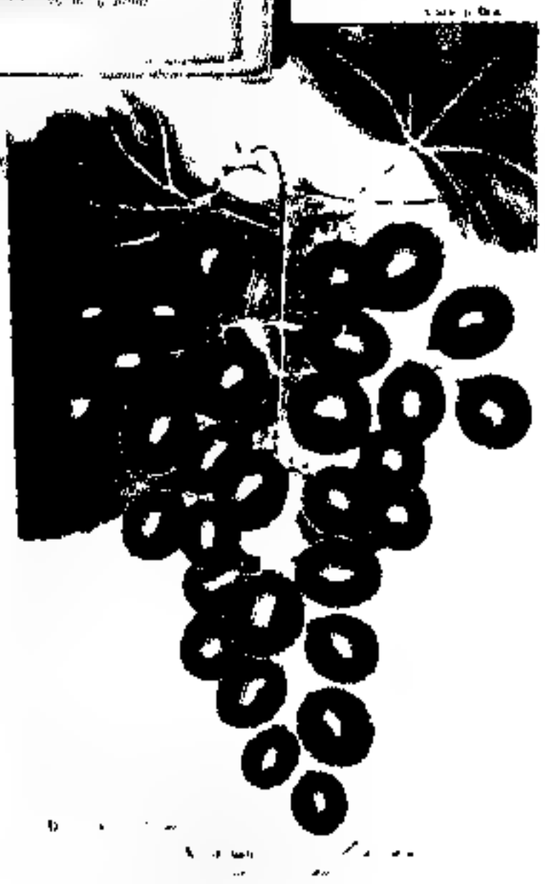


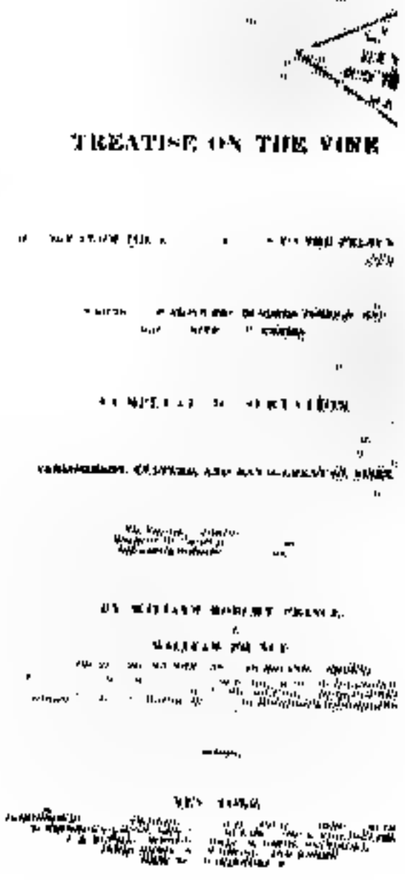


Above at the left is "The Horticulturist" when Peter Barry was one of the editors. Directly above is Andrew Jackson Downing's earliest book.

Thomas Bridgeman wrote extensively both for commercial and amateur growers. At the left is "The Florist's Guide" of 1844. Bridgeman's "Young Gardener's Assistant" of 1829 kept reappearing constantly in revised editions until 1847, and parts of it were republished again around 1865.

Five generations of Princes kept a nursery at Flushing. The "Treatise on the Vine" by the fourth of them was the first of several invaluable horticultural guides written by William Robert Prince.





William Robert Prince.

nursery first bore almost the name that now is attached to this institution here—he called it The New-York Botanic Garden. It was located at what is now 23rd Street and Broadway, then way up in the country—outside of strictly city limits, and he used for office the seed store of Alexander Smith & Sons, 388 Broadway. Thomas Hogg Sr. came to this country via London from his native Scottish Berwickshire in 1820, and started his nursery two years later. Michael Floy reports having visited his nursery and finding his plants looking very fine. Mr. Hogg always had some rare or pretty thing in flower. He did some hybridizing himself and is said to have been the first in New York to import novelties from Europe. In 1840 the nursery was moved to 79th Street and the East River, where Thomas Jr. and his brother James began working with plants. They took charge of the business when their father died in 1855. The fame of the nursery has hitherto sprung from the work of Thomas Hogg Jr. In 1863, President Lincoln appointed him United States Marshal. In this capacity he lived in Japan for eight years, which gave him a chance to explore the islands for plants These he sent home to his brother. Thus were introduced many Japanese plants that are commonplaces in our gardens today. Many were grown here before they were sent to Europe.

Unquestionably the son overshadowed the father, but I should like to lay a wreath to Thomas Hogg Sr., for he it was who introduced into commerce Harison's Yellow Rose, hybridized by George Folliott Harison, amateur. The year was 1830.

As in any other business, so in the seed and nursery trade you can trace a well-marked apostolic succession. Grant Thorburn had been in business many years when he hired a lad of 21, fresh come from Scotland and already well skilled in horticultural practice. His name was Peter Henderson. For a time he also worked under Robert Buist, the Philadelphia seedsman and rosarian. By hard work and grim economies, he managed to save $500 with which he set himself up as a market gardener over in Jersey City in 1847. His "Gardening for Profit," first published in 1865, became a standard work, with "Henderson's Practical Floriculture" appearing in 1868. Both of these were aimed to help commercial growers. However, "Gardening for Pleasure" appeared in 1875 and in 1881 "The Handbook of Plants." Mr. Henderson founded his seed business in New York in 1865 and, as you know, it is still thriving. Mr. Henderson died in 1890.

Since we have mentioned horticultural writing, let us retrace our steps a bit. In 1830 there appeared one of our most important books—"Treatise on the Vine," by William Robert Prince, fourth proprietor of the Prince Nursery at Flushing. And the year following he issued the "Pomological Manual," an invaluable work in two volumes on all kinds of fruit except apples. In 1846 he published the "Manual of Roses."

A botanist of wide experience, he had worked in the field with both Professor Torrey of Columbia and Professor Nuttall of Harvard. Both

his importation of rare foreign plants and his work with silkworms and mulberry trees which he imported mark the breadth of his horticultural interests. Mr. Prince died in 1869 at the age of 74, having lived a valuable and energetic life in the pursuit and advancement of botany, pomology and gardening.

Contemporary with this fourth Prince was another nursery not far away from New York City—that of Charles and Andrew Jackson Downing at Newburgh. The latter, our first outstanding landscape architect, died in 1852 at the early age of 37, by drowning, but he had already won his place both as an author on gardening and for his landscape work. His older brother Charles had first been trained in nursery work by his father. At the age of 20 he started in the nursery business on his own, later taking his younger brother in with him and in 1850 selling out so that he could devote himself solely to pomology. He is remembered for his "Fruits and Fruit Trees of America," a monumental work. In his test orchard were grown 1,800 varieties of apples, 1,000 pears, and other fruits in proportion. Charles Downing died in 1885.

Three years before this date, died James Vick who for 32 years maintained a growing reputation both as an agricultural editor and as a seedsman. In 1850 he took over the *Genesee Farmer* and later *The Horticulturist*, having Patrick Barry as editor. In the middle of the last century he entered the seed and plant business which attained a national repute as the largest in the world. This was furthered by his publication of *Vick's Magazine*, by which he helped spread the love and practice of gardening, running from 1878 until 1891. In addition to Mr. Vick's very worthwhile text, each issue contained one or more color plates.

The mention of Patrick Barry reminds me that I said the Prince Nursery of Flushing would weave in and out of this brief narrative. In 1826, when he came to New York from his native Belfast, Barry worked with the Princes at Flushing and here he was employed for four years. In 1840, moving to Rochester, he founded the Mount Hope Nurseries with George Ellwanger. From 1844 to 1852 he edited the *Genesee Farmer* and, on the death of Andrew Jackson Downing, succeeded to the editorship of *The Horticulturist*. In 1851 his "Treatise on the Fruit Garden" appeared. Mr. Barry had much to do with the beautification of Rochester and with the development of orcharding in Western New York. He died in 1890.

With the passing of this erstwhile employee of the ancient Prince Nursery we might close our short and sketchy survey of New York nurserymen and seedsmen.

But I can not leave these horticultural ancestors without a few observations on what they gave the gardening public of their time and what heritage they handed on to us. These were the foundation layers of a great and vital industry. They were not satisfied with being merchants; they didn't merely buy and sell; they created much of what they sold.

Most of them were men capable of prodigious labors in their nurseries and their shops—and in writing. Many regarded themselves as teachers—witness the number of important books they wrote, books with remarkable spans of life, not like the one-year gardening books that flood the market today. Their writings, based on close study and observation and experience, were not tossed off in odd moments.

Consider Peter Henderson, writing far into the night after a day of labor and answering a voluminous correspondence with his own hand. His contributions to commercial growing alone would be enough to justify any man's life.

In their search for improved strains they were just as alert as any seedsman or nurseryman today. By introducing new and better fruits, new and better vegetables and improved and exotic plants they not alone set the style for "novelties" as we call them, but bore witness to the fact that horticulture can never be static. In laying the foundations of a great industry rendering a valuable service to their fellow men, they also gave to horticulture a vitality that still courses through its veins. The men who lead as seedsmen and nurserymen today follow the same patterns. Show me a leader in horticulture, and I find a man worthy of the heritage handed down by Grant Thorburn, Peter Henderson, Patrick Barry, and the four generations of the Princes.

Balsa—Lightweight Champion Timber Tree

By John H. Pierce

EXPLORERS today are searching the jungles of South America for new stands of the balsa tree, whose tough, lightweight wood is in great demand for the construction of aircraft, combat boats, life-saving equipment, and other products that are urgently needed for the war.

After the last war, with the memory of a great demand for this unique wood still fresh, there was a "balsa boom" and plantations of trees were started in Central and South America. However, as the wartime demand slackened, production declined, some of the plantations were abandoned, and now we are again caught with a critical shortage. Ninety percent of our supply today is coming from one locality which involves serious shipping problems.

The balsa hunters being sent to the American tropics by the United States Government are going into lands where the natives have used balsa wood for countless centuries as their principal means of transportation. The ancient Incas plied the rivers of western South America and made long coastwise trading expeditions on balsa rafts which sometimes carried

Photos: Balsa Ecuador Lumber Cor

Cleared jungle scenes in Ecuador. Th trees with spotted trunks are bals

fifty people at a time. The buoyant logs were lashed together with tough rope-like lianas. In the center of the raft sharp hardwood stakes were driven into the soft timbers and upon these a platform was erected to hold passengers and luggage. A "luxury liner" of the day often had a thatched roof erected over the platform, a mast, sails made of rushes or coarse cotton, a centerboard, and a rudder.

The first Spanish colonists to see an Inca raft called it a "balsa," which is the Spanish word for raft. These early explorers usually gave European names to the unfamiliar trees they discovered in new lands, but there was no Spanish tree like the balsa so the name of the object for which the wood was used became transferred to the tree itself. Hence we have "balsas" which are made from balsa wood (*Ochroma lagopus*), but also made of other materials.[1] The natives of the American tropics know the tree under a number of other names. In Cuba it is "lanero," the wool-giver; Haitians refer to it as "patte de lièvre," or hare's foot; in Guatemala the name is "tambor," a drum; in Salvador it is called "algodón" for the resemblance of the ripened fruit to cotton.

In the thick wild jungles the balsa is seldom more abundant than two or three trees to the acre, but as it is one of the few tropical weed trees, in cleared areas it is often found in pure stands or groves. In fact, it takes over clearings so fast that to the farmer it is often a serious weed pest.

[1] The Philippine "balsa" is usually made of bamboo, while on Lake Titicaca, Bolivia, a "balsa" is made from bulrushes.

The Indians cut the wild balsa and haul it to the river, where the logs are made up into small crude rafts for the journey downstream to market. In the early days there was abundant balsa near the rivers but so much has been cut that now the logs must be hauled from one to three miles by oxen. Being thrifty people the peons make one crop carry others; hence the raft is loaded with tagua nuts, cocoa, bananas, pineapples, and other fruits picked up along the way. Often the two to six weeks' journey to market is dangerous because of the treacherous rapids, bars, and currents, but using long steering sweeps the "balsero" handles his craft with amazing skill and dexterity. Arriving at the mouth of the river, the Indian balsa cutter sells both cargo and craft and, taking the blade of his sweep with him, goes back up the river by motor launch. The fruit goes to the local market; the tagua nuts, or "vegetable ivory," become eventually buttons, and the balsa logs are sold to the larger lumber companies.

While balsa is found from southern Mexico and the West Indies south to Bolivia, the place to see the balsa industry today is in Ecuador on the western coast of South America. Standing on the docks at Ecuador's chief seaport, Guayaquil, you look out across the harbor to see a strange mixture of up-to-date freighters, modern ferries and barges, crude dugout canoes, and the huge cumbersome balsa-wood rafts which have just come down the river. Some of these rafted balsa logs came from the wild steaming jungles; others were grown on well ordered plantations.

Most balsa of good commercial quality comes from the plantations along the tributaries of the Guayas River. If we visit one of these planta-

Photograph by courtesy of International Balsa Corp.

A native raft of balsa logs with a dugout canoe on board and a thatched roof of banana leaves to shelter the family

Photograph by courtesy of International Balsa Corp.

A young balsa tree in a clearing.

tions, we can follow the incredible balsa wood from the planting of the seed to the finished product.

Walking through the balsa groves we see rows of slender, straight, young trees without lower branches, and 60- to 90-foot full grown trees with the very striking, beautifully mottled, white and gray bark. It is hard to realize that such an orderly plantation was hewn from the tangled jungle of the virgin rain forest. Glancing up the length of one of these tall trees you see a crown of huge leaves, each a foot or more long and almost as wide, shaped something like a huge mountain maple or a grape leaf. At the base of a leaf cluster is the large red-petaled flower or the long cylindrical fruit which somewhat resembles a rabbit's foot. It was

Photograph by courtesy of International Balsa Corp.

Primitive method of balsa cutting. The saw is unknown to these native jungle workers.

undoubtedly this resemblance which prompted the botanist Olof Swartz, in 1788, to give the tree the specific name of *lagopus*.

When the ripe fruit-pod splits open it reveals a mass of fine silky fibers in which the seeds are imbedded. At present there is no commercial use for these fibers because of their short staple. The Indians, however, find them admirable for stuffing pillows and mattresses and have been known to make crude cloth from them. Pick up some of this silky "cotton" from the ground and you will see the tiny dull brown seeds which cling to it much as milkweed seeds are attached to their floss. In the

wild jungles the wind carries this seed and if it falls on open ground it germinates. On the plantations the amount dispersed by natural means often makes artificial seeding unnecessary. In fact, the young trees must be thinned out to prevent crowding.

Excepting the wild papaya, the balsa is perhaps the fastest growing tree in the tropics. A six-months-old tree is as tall as a man and a couple of inches in diameter. Most tropical trees are draped with vines but the balsa grows so fast that the vines cannot overtake it.

You will notice that the peons as they cut the weeds and vines around the young trees are careful not to injure them. Even a slight machete wound causes the wood to develop a hard fibrous texture. The tree is

Photograph by courtesy of Balsa Ecuador Lumber Corp.

Chipping the bark from a freshly hewn balsa log before floating it down river to the mill.

Photograph by courtesy of Balsa Ecuador Lumber Corp. (Cia. Ecuadoriana de Balsa)

Laborer carrying a log of balsa on one shoulder, supporting it easily with one hand.

then called "macho," the Spanish for "male," while the normal soft-textured tree is called "hembra," or "female."

At about twelve to fifteen years the tree reaches maturity and develops a stout taproot, but by this time the wood is too heavy and fibrous for the commercial market. The best quality wood comes from trees six to ten years old. The balsa cutters work in pairs and first clear the tangle of growth around the trees so that the balsa will not be "hung up." Then they cut the tree down with broadaxes, for although these natives were brought up in the woods they have never learned to use the saw or to fell a tree in a given direction. Once down, the top and branches are trimmed off and the lower trunk is cut into logs ten to eighteen feet long. When first cut, the green balsa log is quite heavy, since it is saturated with sap. In fact, the erect tree owes its mechanical strength to the rigidity of the turgid, sap-filled cells. It is so heavy then that oxen are needed to drag the logs.

The cut timber is seldom left on the ground for more than a day or two because the soft spongy wood either decays rapidly or it warps and shrinks badly. Once the logs have been dragged to the river's edge the balsa cutters remove the bark and prepare the logs for rafting. Unlike the relatively small Indian or Inca rafts, the commercial rafts are huge affairs sometimes 150 feet long and made up of hundreds of logs chained together.

At Guayaquil the rafts are broken up and the logs are taken ashore to be made into lumber. If you look at the ends of the balsa logs as they go into the mill you will notice that there are no true annual rings as in the trees of the Temperate Zone. This is because, like most tropical trees, balsa grows almost continuously, though in some trees false annual rings are evident, due to the difference in growth rate between the dry and rainy seasons.

The wood is so spongy that very sharp tools are needed for cutting it into boards. As the boards come out of the mill the Indian laborers stack them or pile them on end to permit proper air drying. After a short period this lumber is usually put through a dry kiln which greatly reduces the water content and makes the boards very light. It is not uncommon to see a young Indian boy walk off with 100 board feet of lumber on his shoulder! Sometimes, when the use of the wood does not demand a perfect condition, the lumber is air-dried at the source of supply and is later kiln-dried at the port of delivery.

Since the time of the Incas the ingenuity of the white man has so increased the uses of balsa wood, that today it well merits the title of lightweight champion timber tree.[2]

The demands of war production have multiplied the uses of balsa until at present a list of the industries using the wood reads like the business directory of a Manhattan telephone book. What are the unique properties that make balsa readily adaptable to so many uses?

The wood is remarkable for its lightness, elasticity, buoyancy, and non-conduction of heat or vibrations. From the table below it can be seen that dried balsa is nearly twice as light as cork.

Balsa	7	lbs. per cubic foot.
Cork	13	" " " "
Oak	40	" " " "
Mahogany	45	" " " "
Ebony	73	" " " "

The reason for this extreme lightness is to be found in the microscopic structure of the wood. The cells of dried mature wood are barrel-shaped, and have extremely thin unlignified walls with no cell contents. Moreover, woody fibers of the ordinary sort seem to be absent from this wood, the cells resembling more closely those of the pith or cortex of temperate woody plants, or the tissue of a vegetable like the turnip. While the large ducts or vessels in the circulatory system of the tree are slightly lignified, they constitute only a small proportion of the whole; hence balsa wood is almost pure cellulose, and as such it is easily compressible. Considering its degree of hardness and weight, it is remarkably strong and

[2] There are other tropical American woods as light as or lighter than balsa, such as the "big-bellied" tree, *Pachira barrigon*, and the "quipo," *Cavanillesia platanifolia*, but they either lack the strength of balsa or have not been found in sufficient quantity to be widely used.

elastic. In fact, it is classified commercially among the hardwoods, not among the soft. The resistance of the wood to static bending and endwise compression is about half that of spruce, which has 4 to 5 times the density, and its elasticity is indicated by the fact that a 3-inch cube of the wood compresses to ½ inch under a pressure of ten thousand pounds and comes back to 2 inches when the load is removed. Pound for pound, balsa is one of the strongest of woods.

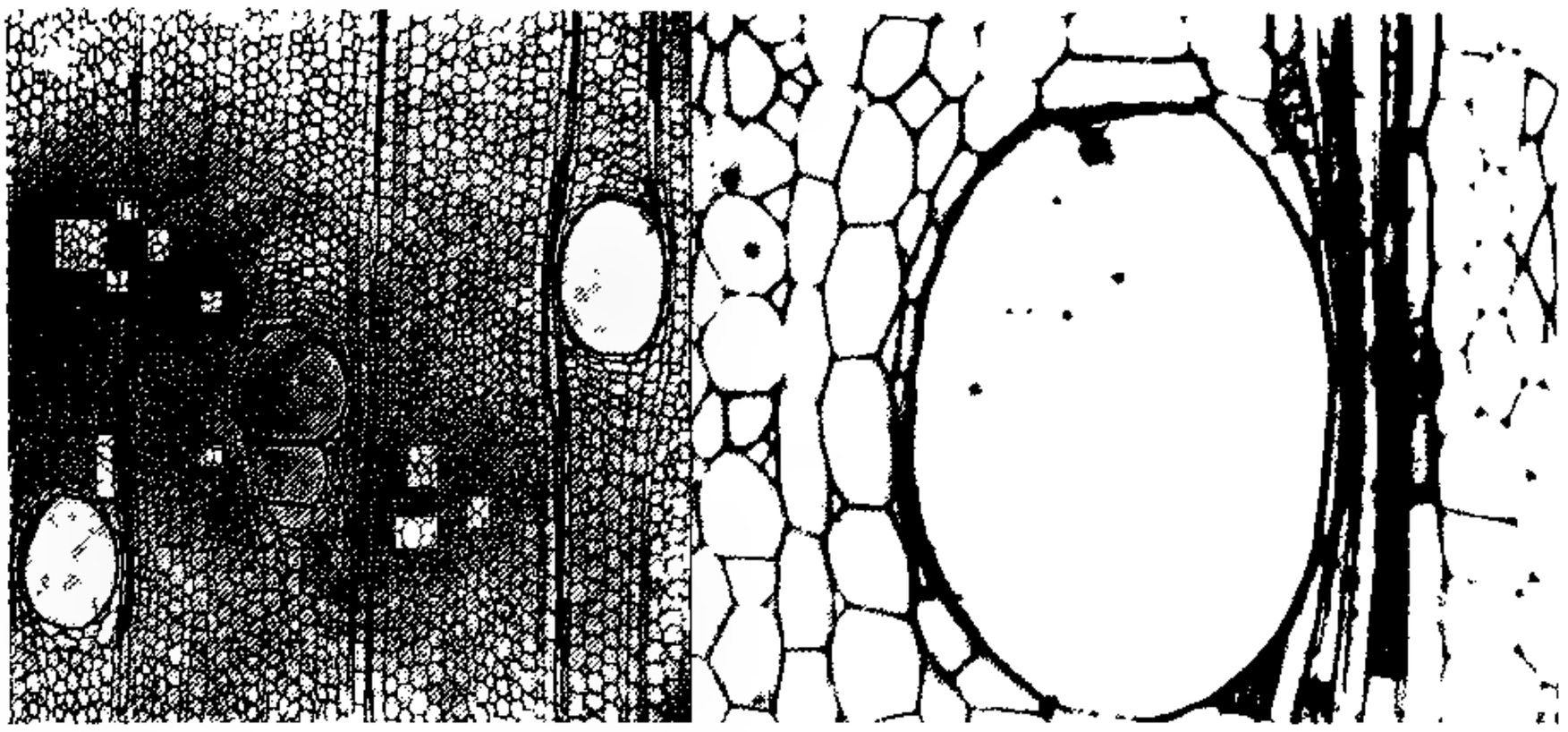
The amazingly light weight of balsa makes it of particular value in the construction of aircraft. To increase the strength and still retain lightness, balsa is often laminated or veneered with other woods. For example, wing braces of balsa are made of pieces veneered on both sides with fiber board 1/32nd of an inch thick. These are built up into I-beams by the addition of strips of spruce ¼ inch thick. Such beams weigh about a pound and a half and will support 750 pounds in the center of a 5-foot span. Ordinary braces of spruce are much heavier and will support only 500 pounds. These built-up woods are used extensively at present in glider construction and in pontoons for hydroplanes. On other types of aircraft balsa is used for fairing, or streamlining, on struts and braces. It is also used in combination with other woods in the new combat boats where a light strong hull makes for speed and striking power. On the U. S. *Manhattan* a gross weight of 150,000 pounds was saved by the use of balsa cores in the cabin partitions.

Every boy who has ever made his own model airplanes knows how widely the wood is used for such toys and novelties. At the present time model planes are in great demand also by the armed forces for instructing our fighting men in plane recognition.

In its natural condition balsa wood is buoyant for a considerable period. But even the Incas realized that the untreated wood absorbed water, for

Photograph by courtesy of Balsa Ecuador Lumber Corp.

Going to the mill. Broad, hardwood blades attached to temporary poles are used as sweeps, or paddles, to steer the raft of balsa logs from jungle or plantation to the mill.



Photograph by F. J. Turner, Yale School of Forestry

Balsa wood in cross section under the microscope At the left the cell structure is shown with a magnification of 32 diameters. At the right is a larger magnification (more than 200) showing a single pore, or vessel, with its slightly lignified wall and beside it a medullary ray. Surrounding them are thin-walled fibers of cellulose tissue

they often daubed the ends of the logs of their rafts with some sort of wax or resin. For present-day commercial use the wood is also treated, and can then be used to make floats for mine barrages, life rafts, life jackets and other life-saving equipment. During the last World War 80,000 balsa floats were used to support a 250-mile submarine mine barrage in the North Sea.

The cellular structure of the wood also makes it valuable for insulation and for absorbing vibrations. The lining of your refrigerator may well be made of balsa wood. In the last war special refrigerator trucks carrying perishable foods to our troops were insulated with balsa. One of the early tests of the efficiency of balsa for insulation was made by sending a piece of frozen butter in a balsa-wood box from Virginia to Los Angeles. The trip took eight days and when the box was opened the butter was still frozen although the average outside temperature during the trip was 82° F. A food container holding 40 to 75 pounds may be used repeatedly and, since it is lighter than the ordinary wooden box, there is a substantial saving in shipping costs, especially in air transportation.

Because it absorbs vibrations we find balsa wood used in the building trades for ceilings and partitions to absorb sound waves, and under heavy machinery to prevent transmission of vibrations to other parts of a building. And so we might go on with a host of miscellaneous peace-time uses, but until the plant explorers find more balsa, and until we have adequate means of treating it at the source of supply and then getting it to market, we will not have enough good-quality balsa wood to meet even the more necessary demands of war production.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

More Vegetable Books For Victory Gardeners

Reviewed by Edwin Beckett

Fruits Also

FOOD GARDENS FOR DEFENSE. M. G. Kains. 246 pages, with appendices. Greenberg Publisher, New York. 1942. $2.

It is common among the writers on "defense gardening" to stress the cultivation of vegetables only, but in this work fruits have as prominent a place as vegetables.

Mr. Kains is so well known in this field of horticulture that comment on his book seems almost unnecessary. The chapters on Home Fruits for High Quality, Dwarf Fruits, and Pruning are well worth digesting thoroughly. In the appendices are given planting charts, selections of varieties, and much other information.

From the Soil Up

MANUAL OF HOME VEGETABLE GARDENING. F C. Coulter Doubleday-Doran & Co., New York, 1942. $2 50

An excellent guide for the vegetable gardener. The author deals with the many important preparatory phases such as soil types, testing, conditioning, and planning in an understandable and convincing manner. Raising Seedlings is an excellent chapter, and the cultural directions for the vegetables discussed are thorough and first-rate. Variety selections and a table of spring and fall frost dates are given, along with other useful data, in the appendix.

For the Beginning Gardener

VICTORY BACKYARD GARDENS. T. H. Everett & Edgar J. Chssold. 96 pages, illustrated and indexed. Whitman Publ. Co, Racine, Wis 1942. 10c.

To write a book for gardeners who have a very limited area and who are also amateurs in the truest sense is no easy undertaking for an experienced gardener, as many operations which he would deem too trivial to mention and explain are of great concern to the beginner. The authors, however, have done an excellent job and dispensed sound advice in a manner that the novice can assimilate.

The chapter on hotbeds and coldframes is clear, concise, and timely, as this is one subject which the beginner is apt to feel beyond his ability. Preparing the Soil is good too, particularly that part of it describing the art of digging.

Various charts on planting, on vitamin and mineral content of the different vegetables, zone maps, etc., are given at the end of the book. The illustrations by Tabea Hoffman are no small part of this work. They are truly descriptive.

An Amateur Tells

HOW TO GROW FOOD FOR YOUR FAMILY. Samuel R. Ogden 139 pages, indexed and illustrated. A. S. Barnes & Co., New York. 1942. $2.

There is much in this book apart from what the title tells. An amateur, gardening in Vermont, not only discloses what is possible there in the way of vegetables but also dispenses his enthusiasm and experience in a clear and easily readable manner.

Necessary fundamental information is given in the chapter on soils. Recipes for cooking, canning, and pickling appear to be excellent, and the appendix gives useful tables on variety selection, control measures for pests, etc. The sound reasoning contained in chapter one, together with the recapitulation later, help to make this book pleasurable and instructive reading.

Contradictory

GARDENING — WITHOUT BUNK. Sam J Boal. 145 pages indexed G. P. Putnam's Sons, New York, 1942. $1.75.

The title of this book is somewhat misleading. One is apt, when surveying it,

to think that the impression is abroad that there is "bunk" in gardening. Whether that impression is rife or not, I know that gardening is no "bunk."

In his opening sentence the author hastens to point out that: "Much of the stuff which appears in much of the literature on gardening is pure bunk." He also informs you in the closing paragraph of this chapter that *his* book contains no bunk whatever. With the first statement I disagree entirely. I will, however, agree with Mr. Boal that there *is* much literature on gardens, and I have found *some* of it bunk.

A good deal of the information offered through this book is haphazard and contradictory. There are many better manuals on gardening.

Miscellany in Paper Binding

WILD FLOWERS OF THE PRAIRIE PROVINCES. Elizabeth Burnett Flock. 112 pages, illustrated. School Aids & Text Book Publishing Co., Regina, Sask., 1942. 75c.

Fifty-word descriptions of 250 common flowers that grow wild in the prairie regions of Canada. The occasional photographs are more successful than the drawings of the individual species.

WHAT DO YOU KNOW ABOUT POISON IVY? George Graves. 20 pages, illustrated. Massachusetts Horticultural Society, Boston, 1942. 25c.

This booklet consists of answers to questions which might be asked by the person unfamiliar with poison ivy and the nature of its poisoning and with methods for its eradication.

NAVAJO INDIAN MEDICAL ETHNOBOTANY. Leland C. Wyman and Stuart K. Harris. 75 pages, bibliography. University of New Mexico, Albuquerque, 1941.

A long list of plants used medicinally by the Navajo Indians and the uses to which they are put in the practice of healing and also in ceremonials.

PRACTICAL AND SCIENTIFIC MUSHROOM CULTURE. L. F. Lambert. 80 pages, illustrated and indexed. L. F. Lambert, Coatesville, Pa., Second edition, 1941. $1.

Instructions for the commercial grower written by a pioneer in mushroom culture in the great producing region of eastern Pennsylvania. Of interest to the layman is the statement in the introduction that mushrooms contain valuable minerals, enzymes, and a considerable quantity of vitamin B.

FLAX AND ITS PRODUCTS. Warren E. Emley. 30 pages. The Textile Foundation, Washington, D. C., 1942. 10c.

Straightforward information about the product of some 11,000 acres in Oregon's Willamette Valley and a few other regions in the United States. Experiments are now being carried on by the Tennessee Valley Authority to introduce flax into that section of the country.

For The Cactus Grower

CACTUS CULTURE. Ellen D. Schulz. 180 pages, illustrated, indexed. Orange-Judd, New York. Revised edition, 1942. $2

One must heartily commend Ellen D. Schulz for such a readable and understanding work upon the culture of cacti and other succulents. This is the type of book that is rapidly making the growing of these interesting plants increasingly popular. Far better than the usual "how I did it" type of book or musty tomes upon botanical relationships and structures, here is a book on culture starting at rock bottom and working up to the topmost graft. The only flaw this reviewer can find is the briefness of the material upon indoor culture. In the greater part of the United States, these tender plants must be grown inside for seven months of the year, and we still wait for a work completely covering the ground for indoor culture under our particular climatic conditions.

This book was first printed in 1932, but the addition of several photographs and sketches and a new chapter on feeding are the only revisions that come to light.

E. J. Alexander.

Nature Study Hobbies

BYWAYS TO ADVENTURE. Edwin Way Teale. 222 pages, indexed, illustrated. Dodd, Mead & Co., New York, 1942. $2.75.

Mr. Teale has written a guide to the avocation of nature study which makes the reader regret that he has only one life to give to his hobbies. Whether he

writes of birds, fossils, stars, plants, or nature photography, he makes that hobby for the moment the most appealing. He opens each chapter with an account of the contributions which amateurs have made to the natural sciences and suggests new fields for their investigation. He describes the equipment needed for each hobby and its cost; also tells how and where the amateur can find other persons interested in the subject. As an appendix to each chapter he lists the most useful books and periodicals for the beginner, the more advanced, and for the specialist.

Sixteen nature hobbies are treated: birds, weather, stars, insects, shells, reptiles, trees, other plants, living things under the microscope, rocks, animals, fossils, underwater life, conservation, photography, and museums.

Among the important amateurs whom Mr. Teale mentions are several who have had connections with the New York Botanical Garden, among them Robert Hagelstein, Honorary Curator, for his authoritative work with slime-molds.

CAROL H. WOODWARD.

For Elementary and Advanced Students

LABORATORY PLANT PHYSIOLOGY. B. S. Meyer & D. B Anderson 101 pages, 24 figures D Van Nostrand Co., Inc., New York. Second edition, 1941. $2

This second edition shows improvement over the first edition in a number of ways. The number of experiments is increased from 132 to 177, including a number on growth, germination and dormancy and on plant movements, which were not in the first edition. The book has a stiff cloth binding in contrast to the manila cover of the original, and it is printed in a two-column arrangement instead of being mimeographed.

References are more conveniently cited at the end of each group of experiments instead of all in one section at the end of the book. The size of the page is the same, 8½ x 11 inches. Alternate pages are left blank for notes. The arrangement of material follows the general outline of the authors' textbook. The experiments are clearly described with adequate directions for carrying them out, and they appear to be readily workable.

Consistent with the ideas expressed in the preface of their textbook concerning the correlation of structure and function, the authors have included a number of exercises on the microscopic study of cells and tissues, such as are usually included in an elementary course in botany and which students taking plant physiology probably have already done. The inclusion of brief anatomical discussions in the textbook, for ready review purposes for the student, seemed very appropriate, but it hardly seems necessary to include such elementary exercises in the laboratory manual. On the other hand, the authors have given such a wide range of exercises and experiments that the book is adaptable for many types of courses and the instructor can vary the subject from year to year by suitable selection.

HAROLD H. CLUM,
Hunter College.

The Plant World, Telescoped

PLANT FAMILIES: HOW TO KNOW THEM. H. E. Jaques 174 pages, illustrated (472 figs.), indexed. Published by the author, Mt. Pleasant, Iowa 1941 $1 50 in spiral binding, $2 50 in cloth

This addition to the Pictured-Key Nature Series is, within limitations, a splendid aid in the teaching of systematic botany and the use of identification keys. It is somewhat unfortunate that—because of the size of this volume in contrast to the size of the Plant Kingdom—too few of the diverse members of many plant families were considered in the preparation of the keys. The inclusion of all groups from Algae and Bacteria to the Compositae makes this volume a convenient reference source for teachers and students of elementary botany. Prepared by an offset process, the book is available with spiral back and paper covers or with a conventional cloth binding.

CHARLES L GILLY.

Improved Text on Trees

TEXTBOOK OF DENDROLOGY. William M. Harlow & Elwood S. Harrar. Photographs, glossary, selected references, index. American Forestry Series, McGraw-Hill Co. Second edition, 1941. $4 50.

In this second edition the authors have revised their earlier well known work in a manner that will facilitate its use. The most significant changes are the in-

clusion of range maps for commercially important species, and the addition of tables of distinguishing characteristics to simplify the determination of related kinds. While the names in the 1937 edition agreed with the American Rules of Nomenclature, this text has completely adopted the International Rules.

The Textbook of Dendrology has been written chiefly for students of forestry and those who wish to become familiar with the commercially important forest trees of the United States and Canada. In the 39 pages of the introduction the student can become sufficiently familiar with nomenclature, classification, identification and description of species to enable him to grasp the ensuing text intelligently. This includes detailed descriptions of nearly 250 species of forest trees which are arranged systematically beginning with the Gymnosperms. Besides the helpful discussion under Botanical Features and General Descriptions for each species, an abundance of illustrations helps to tell the tale of these sovereigns of the forest.

RALPH PINKUS.

Amateur Scientists at Work

A REPORT ON EXPERIMENTS WITH COLCHININE BY LAYMEN SCIENTISTS DURING 1941. O. J. Eigsti and Barbara Tenney 32 pages, illustrated, paper-covered University of Oklahoma Press, Norman, Okla., 1942. 35c

In 1940 the Department of Botany, University of Oklahoma, decided to encourage laymen to experiment with colchicine and record its effect on flowering plants. This report deals with the purpose, plan, and result of the experiment. A total of 327 persons located in 38 states co-operated in the project. Of the completed experiments, 19.4% were recorded as successful; 30.6% as partially successful; and 50% as unsuccessful. The writers report that the results after two years of experimentation seem to show that the use of colchicine by the laymen is, in most cases, not of great economic importance but that it is a valuable method of education which may be recommended as a study project for garden clubs, nature study groups, science classes, and student gardeners. The methods for treating plants with colchicine to induce changes in plant tissues are discussed for the layman.

CLYDE CHANDLER.

Our Present Knowledge Of Vitamins

CHEMISTRY AND PHYSIOLOGY OF THE VITAMINS. H. R. Rosenberg. 674 pages, indexed. Interscience Publishers, Inc., New York, 1942. $12.

An excellent and inclusive statement of our present knowledge of the vitamins. In addition to the text there is included a patent index and an author and subject index. References to the original literature are freely given. This book should be available for anyone seriously interested in this group of substances so important in the physiology of both plants and animals.

W. J. ROBBINS.

General Knowledge of Chemistry In Relation to Life

TEXTBOOK OF BIOCHEMISTRY. Benjamin Harrow, Ph D. 439 pages, indexed. W B Saunders Company, Philadelphia and London, 1941 $3 75

This is a precise and easy-reading textbook of biochemistry for students who are interested in medicine, agriculture and home economics. There are concrete chapters on foods and vitamins which may be considered as topics of the day that everyone should read Table 29—A Digest of Quantitative Values for the Vitamins A, B_1, C, D, and Riboflavin Content of Foods, and the Appendix Nutritive Value of Foods—may be recommended as references for housewives and restaurant managers who are interested in balanced diet for war time.

ROBERTA MA.

Chinese Plant Studies

FLORA OF FUKIEN, and Floristic Notes on Southeastern China. Franklin P Metcalf First Fascicle, 82 pages, two maps Lingnan University, 150 Fifth Avenue, New York 1942. $1 50

From the midst of the confusion of war in China come echoes of peace times. In this book on the flora of Fukien we are taken for the moment back to the busy quiet days when the only noises were those of day-by-day achievement. And there is no doubt of the achievement represented by this work

This initial fascicle of the Flora of Fukien contains not only brief notes on species from Chekiang, Anhwei, Kiangsi,

Kwangtung, Macao, Hongkong, and Hainan dating from the period previous to 1933, but also literature notes up through 1940 on all Fukien and southeastern China species, including Hunan and Kwangsi. Short diagnostic descriptions are attached to all species listed.

The first fascicle contains descriptions of the Fukien species from the Cycadaceae to the Fagaceae. This is introduced by a few floristic notes on southeastern China followed by the story of exploration in Fukien province. Finally, a very carefully worked-out Key to the Families of Fukien brings us to the main body of the monograph, which consists of the systematic descriptions of the plant species. The commendable thoroughness indicated in the study makes this work a standard reference on this section of the world flora.

WILLARD M. PORTERFIELD, JR.,
Soil Conservation Service, U.S.D.A.

Current Literature At a Glance*

In the City. Vegetable growing in the back yard of a house in the city is explained in the revised edition of Farmers' Bulletin No. 1044, issued by the U.S.D.A. Maps showing seven zones with the dates of first and last killing frosts accompany the planting tables. The booklet can thus be used in any section of the country east of the Rockies, but the gardens suggested are not of New York City backyard size. Obtainable from the Superintendent of Documents in Washington for five cents.

Fruit Growing. Brief directions for the culture of fruits in the states from New Jersey to Missouri are given in Leaflet No. 218 of the U.S.D.A. (5c) Varieties of each fruit are suggested and a plan is given for a half-acre garden of fruits and nuts.

Tropical America. A monthly magazine which keeps the reader posted on crops, especially new crops that are being promoted through the co-operation of the Government throughout North, South, and Central America, has been issued by the Office of Foreign Agricultural Relations of the United States Department of Agriculture since February 1941. While it covers territory from Canada to The Argentine, *Agriculture in the Americas* places the emphasis on the tropical regions where so much work is now being done in exploration and in the development of plantations to provide the United Nations with the products formerly chiefly obtained from the East. More than half the issues have contained articles on some phase of the rubber situation, for example. Among other subjects covered so far have been spices, chocolate and other beverage plants, drugs, fruits, sugar, and fiber plants. The magazine may be obtained for 75 cents a year from the Superintendent of Documents, Washington, D. C.

Geraniums. Charles Piper Smith, who since 1938 has been issuing sporadically a leaflet called *Species Lupinorum,* has expanded his non-profit publishing activities to include a new 16-page offset leaflet, *Geranium Records,* for which he charges a dollar for four signatures to cover the printing cost. The third of these has just arrived and it contains lists of varieties, with the dates, colors, and sometimes a brief description, in the "societies" of what he calls the Hortorum, Peltatum, and Species "departments."

Guayule. The General Tire & Rubber Company has issued an informative booklet on guayule and its development from a wild plant in America to its successful culture for the manufacture of needed rubber products.

Soil Treatment. Various methods of treating the soil in greenhouses for the control of plant diseases are given in Cornell Bulletin 217 issued at Ithaca.

Crabgrass. Methods by which the professional gardener can keep in check that persistent pest, crabgrass, as well as other lawn weeds, are told by C. R. Runyan of Cincinnati in the February number of the *Arborist's News.*

* All publications mentioned here—and many others—may be found in the Library of The Botanical Garden, in the Museum Building.

Notes, News, and Comment

Members' Day. The third Members' Day program at the New York Botanical Garden will take place December 2 with Dr. A. B. Stout speaking on "Some Simple Facts About Plant Breeding." The lecture will be at 3:30 p.m. in the Mem-

bers' Room and tea will be served afterward by the Advisory Council. While this new series of programs is not open to the public, members are privileged, in fact, they are urged, to bring guests who in this way can become acquainted with the Garden and its activities.

Eighty-six persons heard the opening lecture by Richardson Wright Oct. 7. The address, with illustrations from the exhibit shown that day, is being published in this issue of the Journal.

Conservatory Displays. South American plants of economic importance, such as cocaine and quinine, balsa wood, kapok or silk-cotton, chicle, rubber, annatto, balsam of Tolu, and the tree-tomato, were the feature of the season's opening display in the Tropical Flower Garden (House 13) in the Main Conservatories the middle of October. The plants were shown in a naturalistic setting of orchids, most of which were hybrid cattleyas of South American parentage.

Later in the month, the Flower Display House (No. 4) was opened with a garden-like arrangement of chrysanthemums in front of the cottage and monastery walls installed last year, with other flowering and fruiting plants, among them several noteworthy specimens of a firethorn (*Pyracantha Duvalii*), there and around the borders of the display house.

The permanent displays of palms, aroids, tropical ferns, and aquatic plants, the pelargoniums and begonias, the two houses of economic plants, and the three houses which contain succulents continue to present, the year around, a living picture of vegetation in warmer parts of the world and of ornamental hybrids of plants suited for greenhouse culture in the North.

At Christmas. Contrary to its usual custom, the New York Botanical Garden this year will not issue holiday greeting cards to its members and friends. The good wishes are there but are not being sent by mail as a matter of wartime economy.

Visitors. Early in October, shortly before they expected to leave for Colombia, Dr. F. R. Fosberg of the Bureau of Plant Industry and Dr. William Campbell Steere, University of Michigan, visited the Garden to obtain information on cinchona in the wild. They are the botanists in a party of eight men being sent by the Board of Economic Warfare to get cinchona bark for quinine from its native jungles.

Seeking information on *Hevea brasiliensis*, Dr. G. H. H. Tate of the American Museum of Natural History came to the Garden later in the month, prior to an expedition to Brazil in search of wild rubber to piece out the diminished supply of this product in America.

Dr. William J. Bonisteel, who left New York in the spring on a drug-plant mission for the Co-ordinator of Inter-American Affairs, returned last month from Mexico and Central America, where he has been promoting the production of tropical plants that are needed for medicine. He expected to return to the American tropics within a few weeks.

Dr. R. E. Schultes of the Gray Herbarium stopped at the Garden Oct. 29 on his way to Colombia on a Guggenheim fellowship. Another Guggenheim fellow who recently visited here is Dr. J. I. Valencia from Argentina, who is spending the year in the United States, studying the grasses of his own country.

Other October visitors include Dr. R. M Moscoso, Director of the Botanical Garden of Santo Domingo; Dr. Samuel J. Record, head of the Yale School of Forestry; Herbert M. Blanche of the Finger Lakes Park Commission, Ithaca; Mrs. Lee Krauss of Philadelphia with Mrs. Fewkes, a begonia specialist of California; Mrs. Francis King, T. A Weston, W. Stephen Thomas, and M. A. Chrysler.

Two visitors of Oct. 7 were Charles Pecora, former gardener, who is now a student cook at Camp Kilmer, N. J., and Mrs. Pecora, who before her marriage was Kathryn Sturges, first a volunteer and then an apprentice gardener at the Botanical Garden.

National Academy. Drs. William J. Robbins and B. O. Dodge, members of the National Academy of Sciences, were in Washington last month for the annual meeting of the Academy Oct. 26, which was devoted solely to business.

Lectures. Among the staff members who have lectured during the past month before outside groups are Dr. William J. Robbins, the Long Island Garden Club; E. J. Alexander on "Plant Hunting in the Rockies" before the American Rock Garden Society in New York; and Dr. H. W. Rickett, who showed the Garden's movie to the Millbrook Garden Club. P. J. Mc-

Kenna addressed a district meeting of the Federated Garden Clubs of New York State Oct. 28.

Staff. Dr E. E Naylor came from Columbia, Mo., in October to become Technical Assistant on the Botanical Garden's staff, working in Dr. Robbins' laboratory. Until the date of his departure he was Assistant Professor of Botany at the University of Missouri.

Medal. Mrs. Clement Bowers of Maine, N Y., President of the New York State Federation of Garden Clubs, presented to Dr. William J. Robbins at a luncheon in New York Oct. 20, the medal awarded by the Federation to the New York Botanical Garden at the International Flower Show last spring. The award was one of two achievement medals given, and was based on the Garden's "outstanding educational exhibit" of food and drug plants used by the North American Indians.

Preserved Flowers. An exhibit of a score of flowers that have been preserved in their original form by drying them in borax or talc has been lent to the Botanical Garden by one of its members, Mrs. Frances A. Williams of Winchester, Mass. They will be on display for several weeks in the Library. Each is shown inside a transparent box. Pressed flowers that have also been subjected to several drying processes are in the exhibit, also tiny boxes decorated with borax-dried flowers and filled with flower petals—a product that has been recommended for occupational therapy. The objects on display represent experiments that Mrs. Williams has been carrying on for several years in an effort to find a satisfactory method of preserving flowers in their natural shape.

Student Groups. Classes in Horticulture and Plant Materials in the Department of Landscape Architecture at Columbia, under the direction of Howard R. Sebold, have been making weekly visits to the Botanical Garden to study the trees and shrubs, rock garden, flower borders, and other groups of plants in cultivation outdoors.

The School Art League of New York City met in the lecture hall the morning of Oct. 3 and heard an illustrated address by George J. Lober, sculptor, entitled "Make Your City Beautiful."

News from Haiti

LETTERS received from Dr. W. H. Camp, who is now in Haiti with the Société Haitiano-Américaine de Développement Agricole (commonly known as SHADA), tell something of the work he is undertaking there. He writes:

"Ordinarily SHADA takes over, by lease or purchase, large acreages—clears, cleans, and plants. SHADA is divided into several divisions or sectors. I am connected with the Cap Hatien Division, which has three subdivisions, two of which are located on the great Plaine du Nord. These two specialize in the raising of sisal, though they do have a lemongrass project to tide them over until the sisal comes into production. The Grande Rivière project, of which I am superintendent, is a little different from anything else in SHADA and, as it develops, is expected to go into research, plant introduction, and co-operative extension.

"My territory begins in the foothills bordering the Plaine du Nord and extends southward—taking in as much as 300 square miles of territory. It is a wild-looking stretch of mountainous country, but rather densely populated, for all its jumbled and confused drainage pattern. The 'agricultural' practices of the region have left little if any of the original vegetational cover -and this on cliff-sides which give no real picture of the vegetation of Haiti. Nevertheless, a few patches do remain which give some indication of what it once was—or what it could be if it were left alone."

He writes further about the avocado, cashew, and breadfruit trees which are common. In another letter he writes of his plans for developing model agricultural areas of around 100 acres; of training a crew of "specialists" in the cooperative extension program to help the native farmers get the new crops started; and of acquiring 75 to 100 acres for a horse farm in order to provide transportation which will not require tires.

SHADA is a corporation formed in August 1941 to encourage the agricultural expansion of Haiti. It is based on an agreement between the Department of State and the Haitian government and has a capitalization of $1,000,000. All the stock is owned by the Haitian government but is pledged to the Export-Import Bank of Washington as security for loans made under a credit of $5,000,000.

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A. C. PFANDER	*Assistant Superintendent*

To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

Blvd., the Third Avenue Elevated to the Bro
to the Botanical Garden station; or drive up

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner in plant identification. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 figures, covering algae, fungi, mosses, ferns, flowering plants. 1918. $3.50

A Text-Book of General Lichenology, by Albert Schneider. 230 pages. 76 plates. 1897. $2.50.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50; unbound $15.50.

Keys to the North American Species of Carex by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora.* $1.25.

Plants of the Holy Scriptures by Eleanor King, illustrated, and accompanied by a list of Plants of the Bible with quotations, in the March 1941 Journal. 15 cents.

Food and Drug Plants of the North American Indian. Two illustrated articles by Marion A. & G. L. Wittrock in the Journal for March 1942. 15 cents.

Hardy Ferns and Their Culture. Edited by Carol H. Woodward. 40 pages, illustrated; bound in paper. 1940. 25 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward. 28 pages, illustrated with photographs and drawings; bound with paper. 1941. 25 cents.

Vegetables and Fruits for the Home Garden. Four authoritative articles reprinted from the Journal. 21 pages, illustrated. Edited by Carol H. Woodward. 1941. 25 cents.

An Herbal. First published by Richard Banckes in London. 1525. Edited and transcribed into modern English with an introduction by Sanford V. Larkey, M.D., and Thomas Pyles. 200 pages, including facsimile of original. Prepared by Scholars' Facsimiles and Reprints. 1941. Price to members of the Garden, $2.50; to others, $3.50.

Succulent Plants of New and Old World Deserts by E. J. Alexander. 64 pages, indexed. 350 species treated, 100 illustrated. Bound in paper. 1942. 50 cents.

Periodicals

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JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

VOL. 43 DECEMBER PAGES

NO. 516 1942 285-312

JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

FLOWERS TODAY FROM A GIFT OF THIRTY YEARS AGO

THE yellow daffodils that will soon begin to bloom in the cottage garden in the Main Conservatories will be part of this year's acknowledgment of a generous deed dating back nearly thirty years—the presentation of the John Innes Kane fund to the New York Botanical Garden

In 1913 Mrs. Annie C. Kane gave the Garden $10,000 as a memorial to her husband, who had been a member of the Board of Managers from its beginning in 1896 until his death seventeen years later. With an appreciation of the pleasure that flowers give to the people and a realization of the value of such plantings and displays as a large botanical garden is able to have, Mrs. Kane stipulated that the income from this fund was to be exclusively used for the purchase of plants for the grounds and greenhouses.

The first plants to be acquired through her fund were the evergreens around the bronze fountain in front of the Museum Building. The following year, 1915, the rhododendrons which bank one side of the Main Conservatories were purchased. Every early summer since then they have bloomed magnificently and the rest of the year have given the greenhouse a foundation of pleasant green.

During the past ten years the number of trees and shrubs in cultivation outdoors at the Botanical Garden has been approximately doubled, and of the 1,500 (more or less) new kinds acquired, a considerable quantity has been purchased with the aid of the Kane fund Some of these are already in place as ornaments to the grounds; others, still in the nursery, will be added later, and together they will give the beauty of their foliage and flowers for years to come.

Next June the public will see for the first time a display of a remarkably fine new collection of hybrid peonies made possible for the Garden by the existence of the John Innes Kane fund. A goodly number of the plants in the Thompson Memorial Rock Garden and the adjoining Wild Garden and Flowering Meadow have also been acquired through this gift of 1913; likewise irises, tulips and callas, as well as narcissi, for the conservatories.

Without the income from such a fund to draw upon, the Garden, through these displays which sometimes attract ten to fifteen thousand visitors on a Sunday, would have much less to offer the flower-loving public. With more funds of this sort, some of the Garden's dreams and plans for greater public displays could be brought to an earlier fruition.

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Art Of The Ancients

A Panorama Of Cotton And Other Textiles From Earliest Days

*By M. D. C. Crawford**

WE have come to associate invention with miraculous mechanical devices and mysterious chemical formulae. During the last two and a half centuries of western European and New World civilization, we have created or elaborated devices, tools, implements and systems to so vast an extent and in such complex directions that we have all but lost sight of the basic pattern of the civilizations from which we stem. I have a vast respect for the men who harnessed steam, who gave us the Second Age of Iron with the coke oven and with steel by the mass production methods of Bessemer; and for those who developed the steamboat, railroad locomotive, telegraph, telephone, automobile and airplane. I have an immense interest in those modern magicians who have produced out of various substances, but mostly coal tar and cellulose, the modern synthetic dye chemicals and fibers. But, I also know that all that we have invented, within the scope of our age, are processes and machines. The basic products of our culture—ceramics, metal work and fabrics—were all produced in other ages, and our machines all follow the patterns set by the simple tools of yesterday.

I am an anthropologist, not a botanist; but, as an anthropologist, I know that within the scope of our modern era, the Age of the Machine, we have not produced a single useful species of plant or animal. All the cereal grains, all the vegetables, all the nourishing roots came from some earlier age of invention which, in its intensity and scope, its variety and increase of wealth, must have resembled the age in which we live. Moreover, in this age, man not only isolated our plants and animals from nature, but he also developed the techniques to convert these raw materials to

* Mr. Crawford is Research Editor of Fairchild Publications, New York City.

Courtesy of American Museum of Natural History

Aztec women wearing cotton garments. Reproduced from the Codex Mendoza, an ancient manuscript from Mexico.

his own use. It is from these earlier tools that all our modern machines spring, as well as all our products in their original form.

In the textile field, I can speak with greater assurance, since that is my chosen field of research. We have not produced a new weave, a fundamental and basic idea of construction, or a new method of applying design and color to cloth within the last 2,000 years. The age in which the world's food and industrial plants were evolved, and also the closely related domestication of animals, also gave us the digging stick, the hoe, the early plow; the first metals; furnaces and forges; the various spinning devices and the loom. This age is called by the anthropologists the Neolithic or New Stone Age, and is usually identified by the presence of the stone axe with a polished, as opposed to a chipped, edge. This implement was, at once, a weapon and a tool, and it was used to destroy forests in order to plant the seeds, which man at first gathered in the wild and ultimately domesticated to his own uses. This age occurred from ten to twenty thousand years ago, but there are still people who live within this scope, notably the sturdy (and at present somewhat confused) native inhabitants of the Solomon Islands.

I am going to discuss, briefly, one single plant, which has had a most profound influence on modern civilization—cotton—and also a few of

the plants that were used in order to impart color and design, not only to cotton, but to other textile fibers of natural origin.

Cotton is pre-historic in the Valley of the Indus—The Punjab, Land of the Five Rivers. From Mohenjo-Daro, we have a reasonably accurate date of an actual cotton fabric—3000 B.C. But cotton had a double origin, since it is also pre-historic in the New World, and pre-Columbian examples of cotton occur from the salt mines of Utah southward through Mexico, Central America, and along the fringe of the desert coast of Peru.

Many years ago it was believed by anthropologists that cotton was the only important plant that was identical in Asia and the New World; but later research has proved that all of the cultivated cottons of Asia have thirteen chromosomes in the pollen cells, while the cultivated cottons of the New World have twenty-six chromosomes, and there are other differ-

Courtesy of American Museum of Natural History

COTTON AND ITS PREPARATION IN PRE-HISTORIC PERU

Left: White and reddish brown cotton in the boll; below the bolls, seeds of the two kinds with lint attached. Center: Masses of white and reddish brown cotton ginned (free from seeds), ready to be carded. Fibers are laid parallel to each other for spinning. (For the use of these two kinds of cotton in weaving, see the illustration on page 291.)
Right: Carded cotton on a spinning cone; the fibers drawn out of the larger end are parallel.

ences which also make them quite distinct.* Moreover, botanists recognize about a dozen species of *Gossypium* scattered over the world's six continents, and on the majority of the continents the early peoples have not only utilized the native species but through them have developed a high degree of artistic skill.

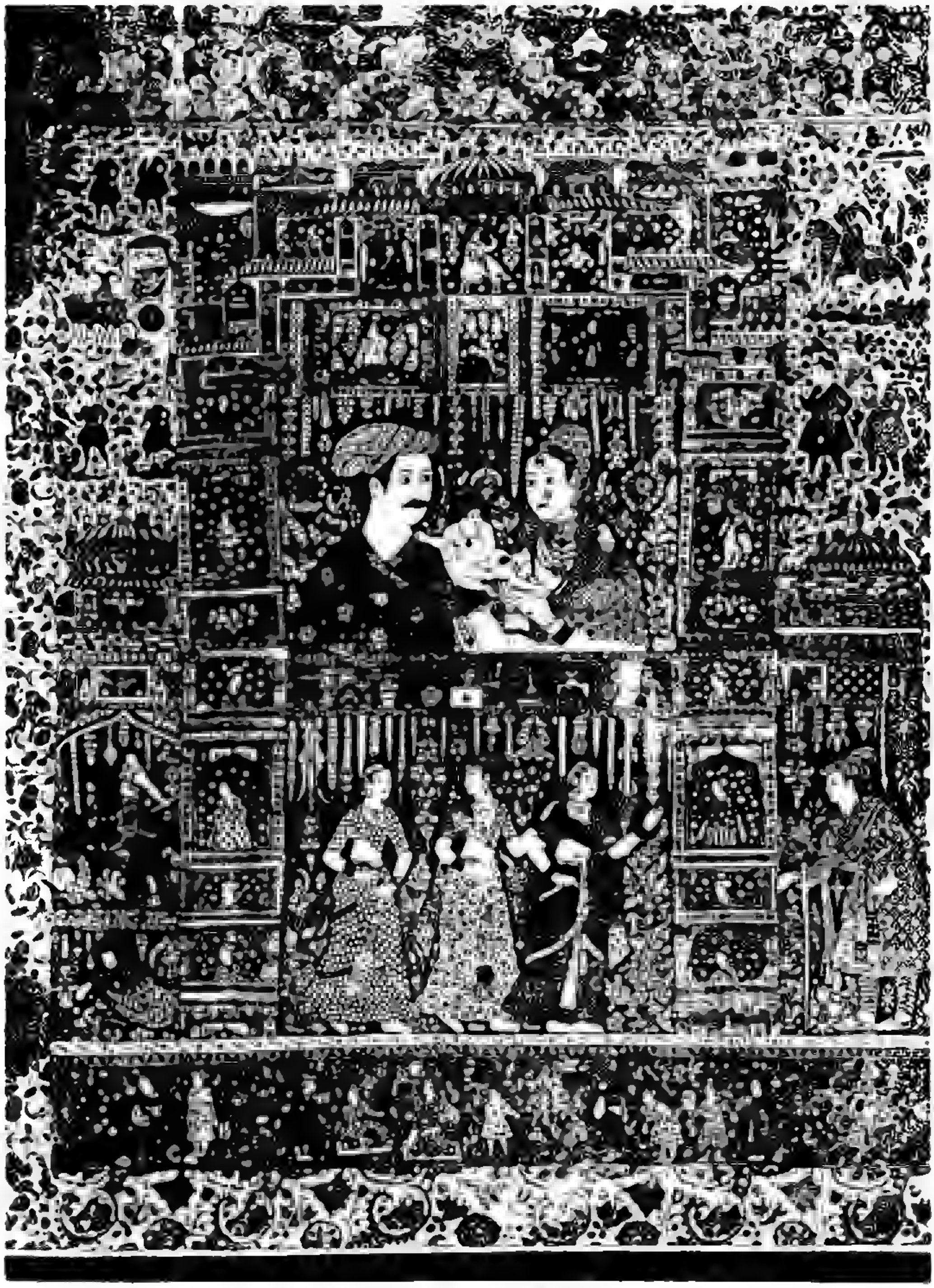
In the graves of Peru we find not only some of the world's most exquisite fabrics, but we also find a most confusing number of technical methods of producing cloth and design in cloth. In fact, in Peru are found all of the basic types of fabric construction. Most of the color in Peruvian fabrics is in the wools from the alpaca, the llama, and the vicuña, but the structure and the nature of the cloth are determined by the character of the cotton fiber.

Cotton, in my judgment, is a late textile fiber. Mankind, at a much earlier date, had learned to spin the rough basts, particularly flax, and the rough native wool from his half-tamed herds of sheep. As a matter of fact, primitive man made cords and yarns from an enormous variety of substances. The bast fibers and the wools, being long and relatively strong and rough, permitted simple methods of spinning, such as rolling on the thigh or by the descending weight or whorl. It is my opinion that cotton first attracted primitive man by its striking blossoms and the opening pods, which revealed the tufts of gleaming white or reddish brown fibers. When he attempted to spin cotton by the older methods, which were already familiar to him, he found the fiber too short and too weak, and he had to adopt some other method. Evidently, in two parts of the world, he stumbled on the same idea—that of resting a bobbin, or a spindle, on a surface that reduced vibration. I have examined thousands of spindles from Peruvian graves. Every one of them which has not been broken shows the tip worn to a high polish, obviously by contact with the little pottery or shell bowls found in the women's graves of that fabulous empire.

Across the world, in the valley of the Dacca, not far from modern Calcutta, the most exquisite cotton fabrics in all the world were once spun and woven for the extravagant courts of northern India. Some of these Dacca muslins were spun from threads which were over 200 miles long, made from a single pound of cotton fiber; and some of the fabrics are reported as having contained seventy yards, one yard wide, to a pound. We have an accurate record of this spinning; and, as in Peru,

---

* According to S. C. Harland in *Bibliographia Genetica* (**9**:107 182, 1932) the species of *Gossypium* in which $N=26$ are as follows: *G. hirsutum, G. purpurascens,* and *G. barbadense* (cultivated in the New World), and *G. tomentosum* and *G. taitense* (wild in Polynesia); while the species in which $N=13$ are: *G. arboreum* and *G. herbaceum* (cultivated in the Old World); *G. Stocksii* (wild in the Old World); *G. Davidsonii* and *G. lanceaeforme* (wild in the New World); and *G. Sturtii* (wild in Australia). Numerous other specific names have been proposed in *Gossypium;* many of these are included by Harland as synonyms of the above listed species.—Ed.



Courtesy of Metropolitan Museum of Art

SEVENTEENTH CENTURY MONGOL PAINTED COTTON

This priceless document, now put in a safe place until the war is over, contains a wide range of colors—reds, blues, greens, and purples—but the principal dyes used were madder root and indigo leaves, with a mordant of some form of alum or of alumroot.

This great piece consists of parts of several originals, all of about the same age.

madder root and indigo leaves, with a ...

This great piece consists of parts of a

the spinner rested the point of the spindle in a pottery dish so as to overcome vibration.

The next step in the cycle is the large Indian spinning wheel, which is a labor-saving device, since it produced at least eight times the amount of yarn possible by the simpler methods, although never so fine or so perfect.

The next step was the flyer of Leonardo da Vinci, which most of us are familiar with on the smaller, or so-called Saxony, spinning wheel of our own ancestors. This flyer embodied the principle adapted by Arkwright and the early inventors in England, whose machines have now been amplified into the miraculous industry of today.

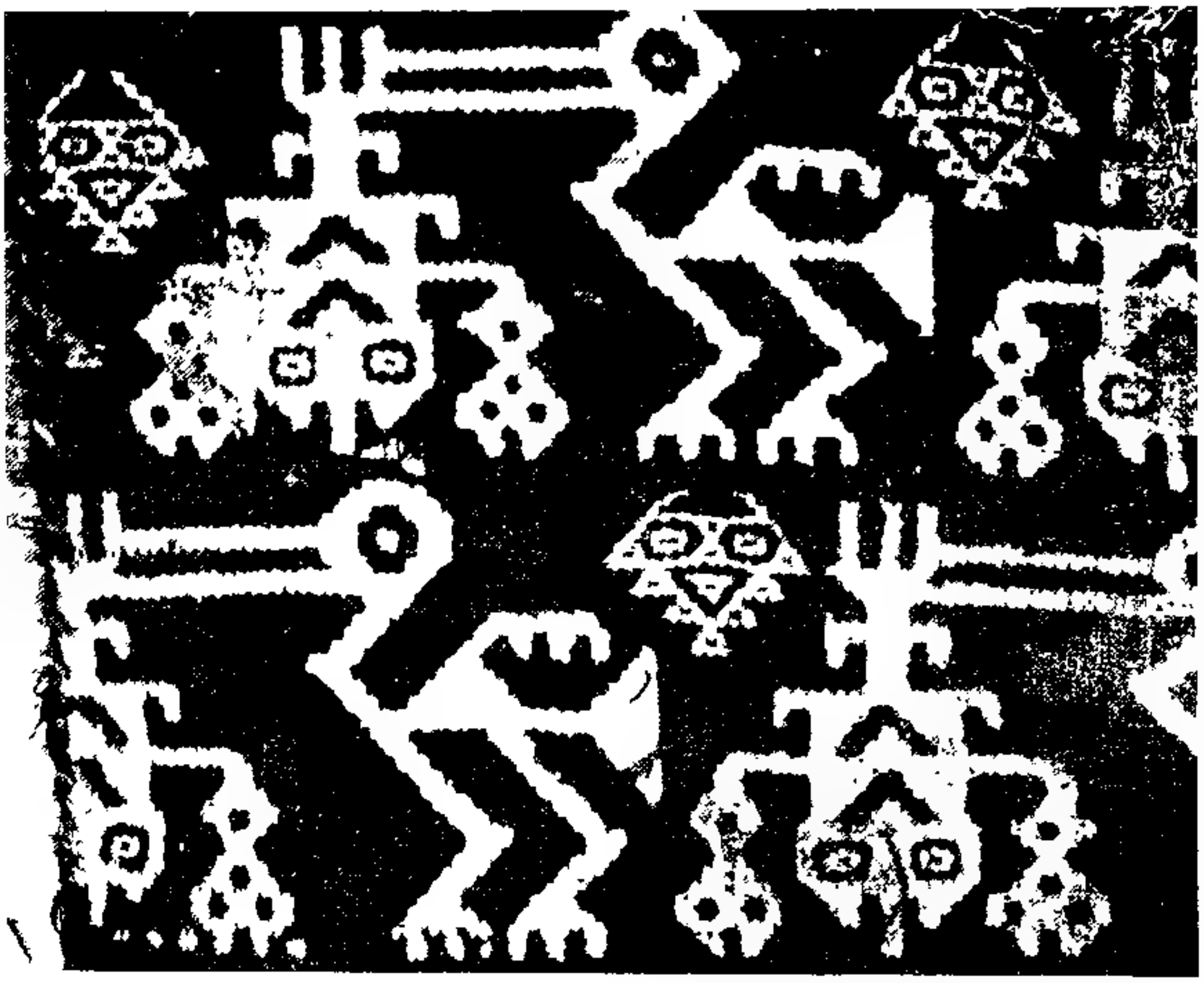
The modern cotton industry is the most perfect of all industries, as far as the use of raw material is concerned. In some of our coarser fabrics, where the mechanization has reached an apparent saturation point, we produce from 95 to 98 pounds of yarn from 100 pounds of clean cotton; and one spinner and an assistant take care of a machine that has over 3,000 spindles, revolving at from 6,000 to 10,000 revolutions a minute, according to the desired twist in the yarn.

But, with all our mechanization, and with all the beauty and symmetry of our machines and machine systems, we have never yet produced the exquisite gossamers of forgotten yesterdays.

I would like to give a schedule of dates, not of the origin of the textile fibers, but the earliest dates we can as yet ascribe to them. We have dates on linen, or a flax-like fiber, from the Swiss Lakes and from predynastic Egypt at least 7000, perhaps 8000, B.C. We have evidence of trade in wool from Asia Minor about 4000 B.C. The most ancient cotton we know of, as I have said, was from the Valley of the Indus, and is dated, with reasonable accuracy, about 3000 B.C. Cultivated silk, while an animal fiber, still was dependent on a cultivated tree, the mulberry, and has a date of about 1200 B.C.

The earlier flax and woolen fabrics were woven, or rather interlaced, into cloth, on a single bar loom, such as we know from the Swiss Lakes, 7000 B.C.; from Greek vases, 500 B.C.; and also among the living tribes of the Pacific Northwest. But when cotton was spun, it was discovered both in the New World and in Asia that the filaments were too flexible for so crude a device. So a second bar was added to the bottom of the loom, and thus began that series of evolutionary processes which produced the modern mechanical loom of today, which, in its most advanced form, shoots over 200 picks, or weft yarns, a minute across the warp, and which is so highly mechanized that, in the coarser weaves, one weaver can care for 100 looms.

Every year, the world produces and consumes between 25,000,000,000 and 30,000,000,000 pounds of cotton. The nearest fiber in quantity is wool, with 4,000,000,000 pounds of new wool, and about 3,000,000,000



Courtesy of the Brooklyn Museum

Natural brown and white cotton are woven in contrast here to produce the design in this double cloth from Huarmey in pre-historic Peru. Note the fish and the pelican-like birds which are carrying the men.

pounds of re worked wool. It is difficult to give an accurate estimate on the synthetic fibers because of the increase of their production, both in Europe and America, due to the war and the absence of cocoon silk, but something between 1,500,000,000 and 2,000,000,000 pounds would be a liberal estimate. We in America consumed, before this war, about 85% of all the silk that sailed on salt water, and our consumption varied between 100,000,000 and 120,000,000 pounds a year. So you see that cotton, so far as quantity is concerned, is not only the most important of all textile fibers, but it is more important than all other fibers put together.

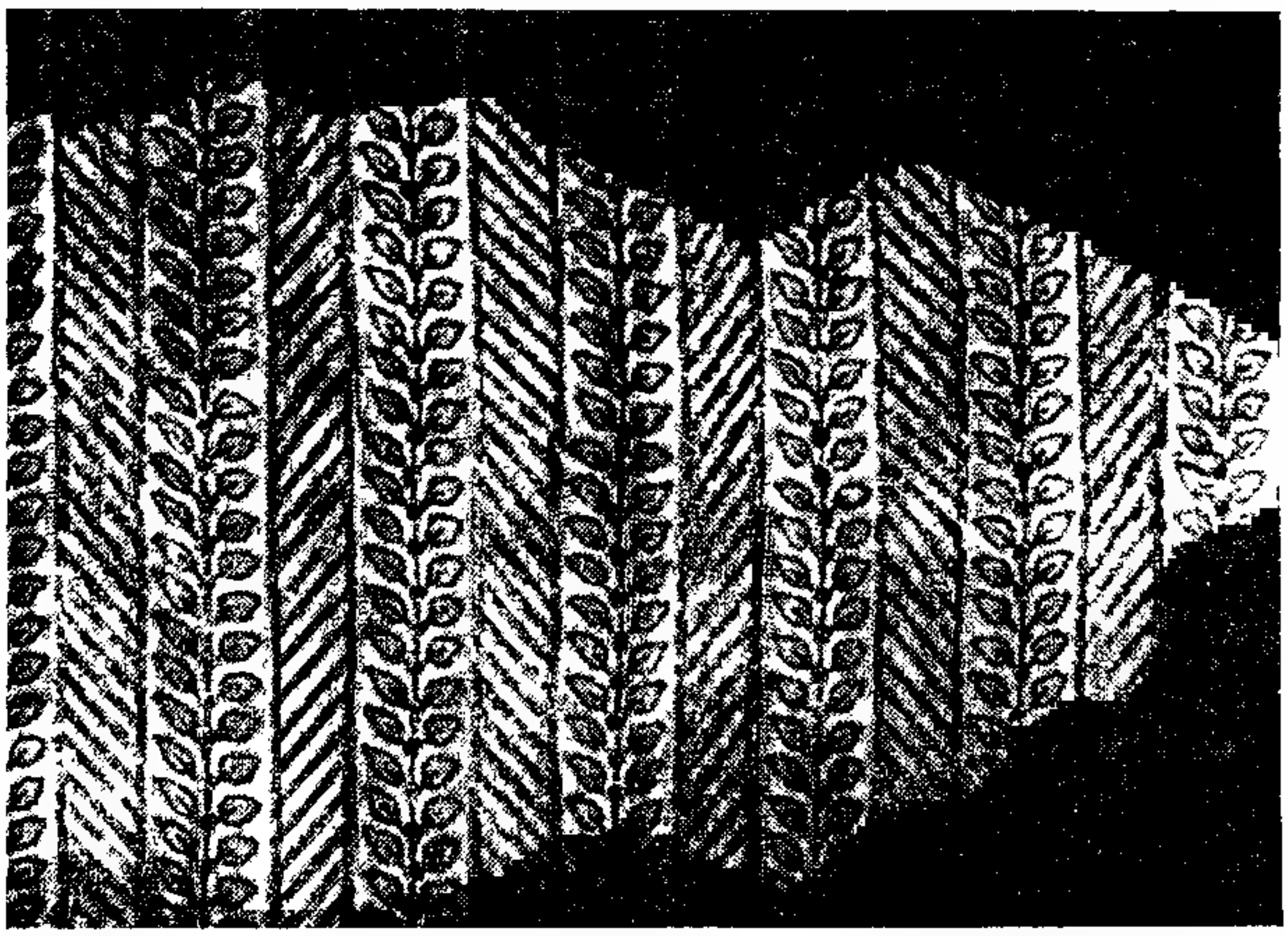
No single influence on western trade was greater than the introduction of the painted calicoes of India in the 16th and 17th centuries. We have adapted the eastern methods of dyeing and printing to our own purposes by mechanizing them, and we have turned a great art into a commercial commodity; but our triumphs have been in quantity, never in quality or in variety of technique.

Up to the middle of the 19th century, all dyes were of vegetable origin, with certain slight exceptions. Royal purple, of course, came from the

juice of the murex shellfish, known both on the Mediterranean and along the western coast of Central and South America, and the use of alum as a mordant has been known since the time of Crete, or 2700 B.C. But the other textile dyes came mainly from plants.

I would like to call attention to only a few of these dyes. One, of course, was indigo, which, as the name suggests, was originally from India. It was accurately described by Herodotus, 450 B.C., but it was much more ancient than even the records of this worthy "Father of Modern History." Indigo is still used in large quantities to dye the uniforms of the American and British sailors, and it was imported, up to the middle of the 19th century and later, from India, Africa, North and South America, Manila and Java.

The other important dye material of antiquity was the madder root. In the first trade document written in a European language (Greek), we have a record of trade in this root between Asia Minor and India from a periplus, or narration of a coastwise voyage, in the first century of our



Courtesy of the Brooklyn Museum

DACCA MUSLIN WITH STAMPED DESIGN, ORIGINALLY WITH GOLD LEAF DECORATION

The finest of all cotton fabrics were those from ancient Dacca. Some yarns were so light that that one pound of cotton could be spun into more than 200 miles of yarn, and the fabrics woven from these yarns would measure 70 yards to a pound.

era. But the madder root has an infinitely more ancient origin in India and the Near East. Both indigo and madder have been continuously used for dyes throughout the ages, and were very important cultivated crops in North and South Carolina and in Georgia in the middle eighteenth century.

Three insects of the Shield louse family produced the brilliant scarlets of antiquity: one, the kermes, which lives on an oak, *Quercus coccifera* of Persia; another, lac, derived from *Tachardia* (*Coccus*) *lacca*, which lives on species of fig in Siam and southern India; and the third, our own cochineal from Mexico and Central America, which lives on a cactus (*Nopalea cochinellifera*), and which was exported by the Spaniards to Africa and, ultimately, to the Near and Far East. The plants supporting these insects were cultivated, or at least protected by man, for the sake of this valuable dye, which was obtained from the female.

In the memorable works of Persoz on the printing of fabrics, published in 1846, more than sixty different materials more or less closely associated with the word "botany" were a part of the world's trade at that time.

Toward the end of the 19th century, the synthetic dyes developed in Europe began to be exported to the East, and were used by the people of the East in their homes, but not by the Dyer's Guild. From that time on, the arts of the Far and Near East have deteriorated almost in the same ratio that our own machine-made products have improved.

I know that it is impossible to go backward in the time cycle of invention. We are in an age of synthetic chemistry, of highly creative imagination in laboratory and workroom.

There has been a rapid improvement in the quality of our industrial art, and we will do still better as we study and compare the values which have come down to us from the past history of the arts of dyeing. But, if we are entering into a world in which we will again exchange products and build up markets for our goods by buying the productions of other regions, it seems to me that some effort to restore the trade in the ancient dyes might be a move, not only in the direction of a better and sounder textile art but also toward a more rational economy.

Saturday Lectures to be Resumed Jan. 9

Howard R. Sebold, who has brought many classes from Columbia University's School of Landscape Architecture to the Botanical Garden to study the trees and shrubs and other plantings, will be the first speaker on the winter lecture program, which will begin on Saturday afternoon, Jan. 9. Using kodachrome illustrations, most of which were taken at the New York Botanical Garden in late fall and winter, he will speak on "Ornamental Fruits and Berries in the Winter Garden."

The second lecture, Jan. 16, will bring Prof. and Mrs. Clarence H. Young to the platform again, speaking this time on "Pre-War Rambles in Northwestern Greece."

The completed program will be printed in the Journal for January.

Ash Trees Threatened By Lilac Borers

By Ralph Pinkus

A RECENT outbreak of borers which are attacking the ash trees at the New York Botanical Garden has already caused the death of several trees and is threatening the existence of many others. A similar infestation occurred about twenty-five years ago [1] but was finally subdued, either by the natural enemies of the borers or by climatic factors. This suggests the possibility of cyclical variations in the abundance of these borers.

Appearance of Infestation

In the spring of 1941 a large specimen of green ash, *Fraxinus pennsylvanica lanceolata*, leafed out only sparsely. Close observation of the trunk showed the presence of numerous holes about a quarter of an inch in diameter, obviously made by borers. As the season advanced new holes appeared from which large quantities of frass, the sawdust-like refuse from the insect larvae, were forced out. Some of the frass stuck loosely to the bark, but most of it dropped to the ground. By the end of July, when the frass stopped falling, an inch layer had accumulated on the ground surrounding the base of the tree.

A month later brown chitinous pupal cases an inch in length were protruding from many of the holes. It was evident that the adults had emerged and disappeared. By this time the tree was so weakened that nearly all of the leaves had fallen and many of the branches were dead. By winter the whole tree was dead and it was then cut down and burned.

Within a distance of two hundred yards from this tree were several specimens of the common white ash, *Fraxinus americana*. These had also been infested, but the damage did not become apparent until late in the spring of 1942, when the upper branches showed signs characteristic of failing by producing few leaves, and this scant foliage dropped prematurely during the summer. Late in August and early in September there emerged from the holes in the trunk curious-looking insects which at first glance appeared to be wasps. It was noted that they emerged only on sunny days, never when it was heavily clouded or raining.

Life Cycle of the Invader

The adult of this insect, which is a clearwing moth, is an inch long and metallic black in color with a narrow orange band across the abdomen and orange markings on the legs. The forewings are also black, but the hindwings are transparent except for an opaque margin. The upper part of the thorax and part of the head are of a reddish color similar to that

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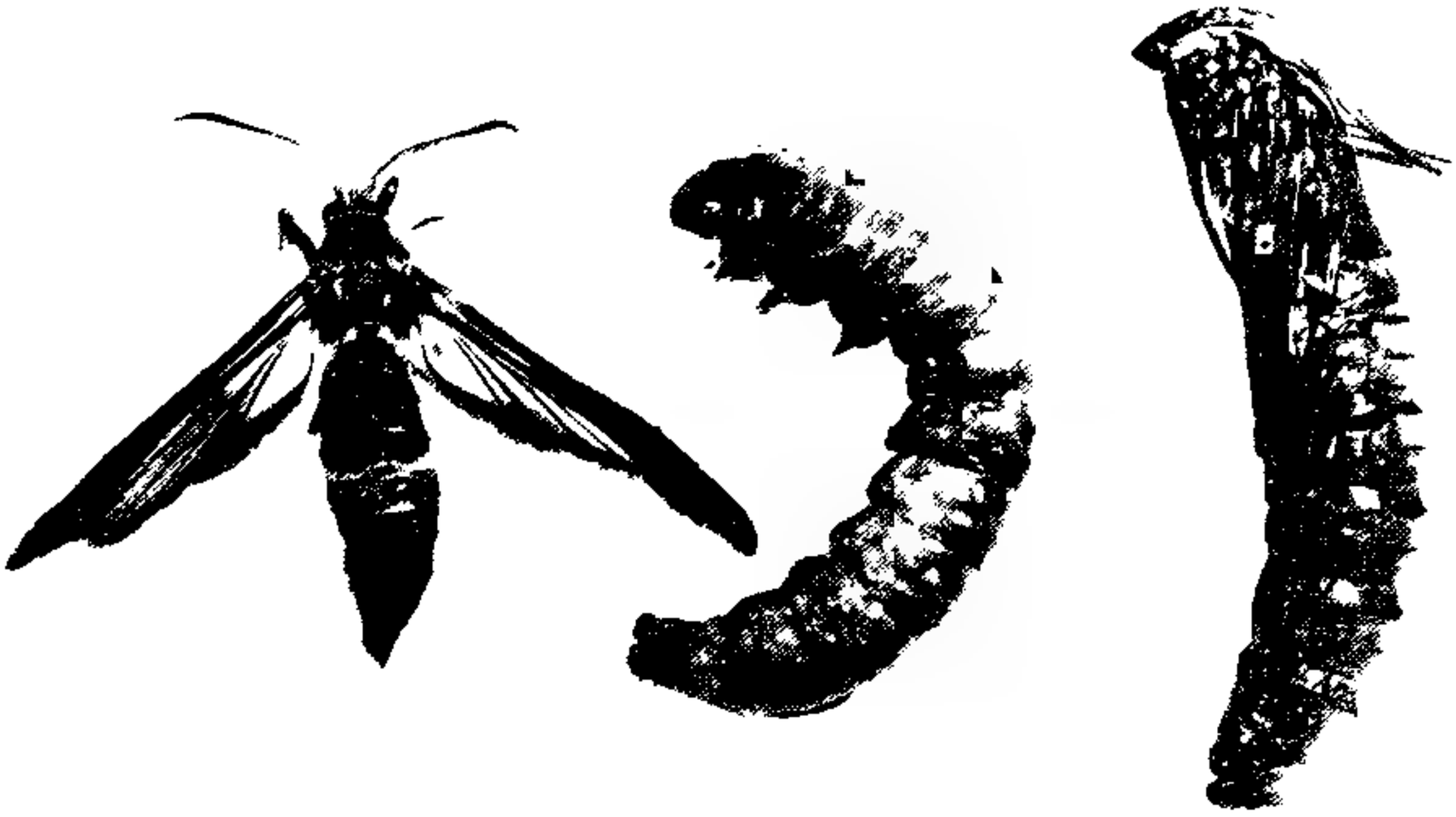
[1] Seaver, Fred J. Borers Infesting the Ash. Jour. N. Y. B. G. XVII (199) : 95-97. July 1916.



Photographs by Fleda Griffith

Adult (left) and larvae of the clearwing moth, Podosesia syringae, which has become a menace to ash trees. The moth is shown here 1½ times natural size, the larvae approximately double

found on certain wasps of the genus *Polistes*. The insects described are the adults of the lilac borer, *Podosesia syringae*,[2] a moth whose diurnal habit of activity and resemblance to a wasp presumably serve as means of protection. Yet, as in other moths, the wing scales rub off readily when touched.

Immediately after emergence the moth clings to the bark on the sunny side of the tree. Here the integument hardens, enabling the insect to fly in an hour or two. If handled before it can fly the legs are apt to fall off.

The eggs are laid in crevices of the bark. After hatching, the young larvae, whose food is wood, chew their way about two inches into the trunk, where they remain for the winter. This depth of overwintering is probably responsible for the lack of borer activity on wood less than two inches in diameter.

The mature larva is an inch long and white throughout except for its glossy brown head. During the summer it lives by chewing tunnels

[2] The moth was identified by Dr. Charles D. Michener of the American Museum of Natural History. In spite of its name, it has frequently been recorded from ash in the past. Though somewhat larger than the other specimens of *P. syringae* in the Museum's collection, its structure and markings are similar. The lilac borer belongs to the family Aegeriidae and is related to the ash borer, peach borer, poplar borer, and maple borer, which are also clearwings. The ash borer, *Podosesia fraxini*, its nearest relative, is found west of the Mississippi River and the adult can be readily distinguished by its light brown instead of black forewings. The larva of the leopard moth is a much larger borer than the lilac borer and is frequently responsible for injury to the lilac.

through the wood. In preparation for pupation it clears a passage to the surface of the bark to make possible the later emergence of the adult moth, which has no jaws for chewing the wood. The larva then pupates with its head facing the opening but far enough back in the burrow to be invisible.

The pupal state lasts about a month. The glossy chocolate brown pupa then works its way to the opening by means of short bristles or tubercles on its abdominal segments and the moth emerges, leaving the pupal case projecting from the opening of the burrow.

Possibilities of Control

The adequate control of borers is not a simple matter. Familiarity with the life history of the insect may reveal a period in its development when it can be attacked and exterminated. Some borers can be eliminated during the height of their activity by means of a sharp wire inserted through the hole they have made, but this is a difficult and inadequate method for one like the borer in the ash, which penetrates deeply into the wood in an irregular channel. A nicotine paste was used by Dr. B. O. Dodge to plug the holes while the borers were active within, but several moths emerged after the paste was applied. Either the borers forced the paste out or there were some untreated holes. This treatment requires further experimentation.

Though the method is still untried, it may be possible to control these borers by plugging the holes with putty during the period of pupation, the early part of August, to prevent the moths from emerging. Neither the pupae nor the moths are equipped with sufficiently powerful mouthparts to clear this kind of obstruction.

In the case of a heavy infestation where many trees are attacked it is almost impossible to save the trees by artificial means. The control must be left to natural enemies such as birds, insects, and diseases which may overcome the borers in one stage or another.

The removal and burning of infested trees to prevent the spread of the insect is done most effectively during the long period after the eggs are laid and before the adults emerge, that is, any time from October to the following August.

Six Members' Day Programs Announced

THE first Members' Day of the new year will occur the afternoon of Jan. 6, and from then to June a program will be given the first Wednesday of each month at 3:30 p.m. in the Members' Room. Exhibits of plant material from the greenhouses and grounds and of books and other pertinent materials will continue to be a feature of each occasion, and tea (or a substitute for it) will be served at the close of each talk by the Advisory Council. Below is the schedule announced for the first six months of 1943:

January sixth
Otto Degener, Collaborator in Hawaiian Botany
"Collecting Plants in the Fiji Islands"

February third
H. W. Rickett, Bibliographer
"'A' Stands for Allium" — Why Gardeners Use Such Names

March third
T. H. Everett, Horticulturist
"Petticoats and Peonies"—A Timely Talk on Women Gardeners

April seventh
B. O. Dodge, Plant Pathologist
"Priorities and Pest Prevention" Keeping the Garden Clean Under Wartime Shortages

May fifth
Ralph R. Stewart, Acting Curator (On leave from Gordon College, Rawalpindi, India)
"High Alpine Plants from Kashmir"

June second
F. J. Seaver, Curator
"Fungi in Their Relation to Man"

Notes, News, and Comment

To Mexico. Three men from the New York Botanical Garden are members of a U. S. Government wartime mission in Mexico, for which they reported Nov. 30 in Washington, D. C.

One of them is Charles L. Gilly, who has been botanical artist for the taxonomic staff of the Garden since 1939. With headquarters in Mexico City, he will serve as taxonomist for a drug crop investigation project under the U. S. Board of Economic Warfare, working in cooperation with the Mexican Government and its Agricultural Ministry. During his years at the Garden Mr. Gilly has also been a graduate student at Columbia, working during the past year for his Ph.D. He was granted a Master of Arts degree last June with a thesis on the chicle-producing members of the Sapotaceae.

Accompanying him to Mexico are

Donald Dodds, Assistant Greenhouse Foreman, and Robert Simpson, a former student gardener, who will go as plant propagators Mr. Dodds, who began work at the Garden as an apprentice in October 1933, becoming a student gardener less than a year later, was graduated from the Science Course in 1936. Meanwhile, at the end of 1935, he had gone to work on the estate of Mrs. Roswell Eldridge at Great Neck. In September 1938 he returned to the Garden's employ as Assistant Foreman in Range 2. Mr. Simpson began work as a student gardener in June 1938 and was graduated from the Science Course three years later, shortly after leaving for a position on the estate of Mrs. H. P. Davidson at Locust Valley, Long Island. He worked again at the Garden for a few weeks prior to his departure.

To Guatemala. Ralph Pinkus, Arboretum Foreman at the Garden, left at the end of November to go to Guatemala for Merck & Co. to propagate and cultivate cinchona for quinine production, as part of a wartime expansion program being carried on in co-operation with the U. S Government. Mr. Pinkus came to the Garden as a student gardener in May 1937, after graduating earlier that year from the National Farm School in Doylestown, Pa. He became Arboretum Foreman in October 1938.

Inter-American. Dr. Earl N. Bressman has been named Director of the Inter-American Institute of Agricultural Sciences, it has been announced by the Pan-American Union in Washington. The secretary is José L. Colom. Headquarters will be in Costa Rica and the research facilities offered by a number of the South American republics will be utilized in the institute's program of fostering the advancement of agriculture through teaching, research, experimentation, extension activities, and both general education and specialized training.

Exchange Students. While Leonard Kline, who went to Montreal as an exchange student gardener in August 1941, continues working and studying there for another year, Wilfred Meloche came from the Montreal Botanical Garden Oct. 12 to spend a year at the New York Botanical Garden on an exchange basis. This is the second year of such co-operation between the two institutions.

Visitors. Dr. Charles Thom, who has recently retired from the Bureau of Plant Industry in Washington, D. C., visited the Garden Nov. 24 to consult with several members of the staff. He is revising his work on the Aspergillaceae with Dr. Kenneth Raper of the Northern Regional Research Laboratory at Peoria, Ill.

Dr. A. J. Grout came to the Garden the end of October to work in the Elizabeth Gertrude Britton Moss Herbarium for about a week. Mrs. Inez Haring arrived from Poughkeepsie to work with him for a day.

Dr. W. C. Coker of the University of North Carolina spent a week at the Garden recently studying the Hydnaceae of the Banker collection preparatory to a monograph for *North American Flora.*

Among other visitors of the past month were Jean-Marie Consigny Putnam from California; Neil E. Tillotson, Needham Heights, Mass.; John C. Wister, Philadelphia; Wanda K. Farr, Greenwich, Conn.; and William Beebe, Norman Taylor, and Helene Carter, all of New York City.

Torrey Club. Dr. B. O. Dodge, assisted by Dr Mary Bartley Schmidt, spoke before the Torrey Botanical Club at the Garden the afternoon of Oct. 21 on "Heterocaryotic Vigor in the Fungi." The following month, Mrs. Annette Hervey took part in the program at the Garden, speaking on "The Use of *Phycomyces Blakesleeanus* in the Assay of Thiamin in Agar." Otto Degener was scheduled to speak before the club Dec 1 at the American Museum of Natural History on "Botanizing in Fiji."

Lectures. Dr. William J. Robbins addressed the Long Island Horticultural Society Oct. 21 at its annual meeting. In his talk he stressed the fact that home grounds and environmental plantings should be kept up during the war years in fairness to our fighting men as well as for our own benefit. Dr. F. J Seaver lectured before the Montclair Garden Club, an Affiliate of the New York Botanical Garden, Oct. 16 on "Scenery and Gardens of Bermuda." T. H. Everett spoke before the Garden Circle Club of New Rochelle Oct 6 on getting a running start for next year's garden; before the Madison (N. J.) Garden Club Oct 19 on house plants, and in Porchester Nov. 6 on victory vegetable gardens. P. J. McKenna spoke at the October meeting of the Horticultural Society of New York.

In Service. Anthony Paterno left his post as temporary gardener at the New York Botanical Garden November 15 for service with the U. S. Army. He came to the Garden in July 1941 as assistant gardener in the orchid collection, and was made a temporary gardener last August.

Elmer Oringer, a student gardener since June 1, left for service with the Navy November 10.

Students. Nearly fifty botany students from New Rochelle college under Professor J. Carolyn Ferris made a tour of the Main Conservatories Nov 21.

Judges' Course. P. J. McKenna will speak on roses on the second day of the 13th annual Judges and Exhibitors Course being offered by the Federation of Garden Clubs of New York State, Inc., at the Waldorf-Astoria Hotel Jan. 12-15. The practical rather than the temperamental will be emphasized in the four day program, which includes among the speakers Dr. R. C. Allen of Cornell and John Taylor Arms, President of the American Society of Etchers.

Conference. John H. Pierce reported on "Studies in the Alismaceae" and Charles L. Gilly on his research with sedges under the title of "Inflorescence Development in *Carex* and Related Genera" at the conference of the staff and registered students of the Garden November 12.

Plant Associations. Seven dioramas representing typical examples of the three forest climaxes evergreen, oak-hickory, and beech maple—and the transitional and successional plant communitites leading up to them are shown in the new Hall of Michigan Plant Associations at the Cranbrook Institute of Science, which was opened to the public Nov. 14 after the annual Members' Night program on the 13th at Bloomfield Hills, Mich.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

What Rural Life Means to The Populace

GETTING ACQUAINTED WITH AGRICULTURE. George P Deyoe & Fred T Ullrich 736 pages index, illustrations, suggested pupil activities, charts and graphs The Interstate Printers and Publishers, Danville, Illinois 1941 $

Whether we live in city or country, we are all dependent upon the products of the farm; hence a clearer concept of farming and rural life, on the part of city people, would do much to bridge the gap of misunderstanding that has long existed between these two groups.

The beginning chapters of this book, which emphasizes the importance of agriculture to all citizens, whether rural or urban, deal with life on the farm, rural youth and the back to-the-land movement. Rural organizations are discussed as well as the opportunities the farm and rural community offer to young people. Later chapters are concerned with soil fertility, field crops and farm animals and their place in a well rounded farm business enterprise. Particular attention is given to the increasing of crop yields and livestock production and the effect of such increases on improved standards of living. Later chapters in the book discuss the marketing of farm products and co-operation in rural life, with concluding chapters on "Careers in Agriculture" and "A Changing Agriculture." These last chapters should be of especial interest to young men and women faced with the problem of choosing a vocation, particularly if they feel they may have a liking for country life.

Competent teachers of background, orientation, and vocational courses should find the book helpful; rural school teachers, 4-H Club leaders and others interested in the welfare of rural young folk will find here source material for directing the activities of their group.

City people who plan to move to the country will find much in "Getting

Acquainted With Agriculture" to help them adjust themselves and their families to a new mode of life.

L. M. STEPHENS,
State Institute of Agriculture, Farmingdale, N. Y.

Adaptation in England

FARMER'S GIRL. Elizabeth M. Harland. 312 pages Stephen Daye Press, Brattleboro, Vt. 1942. $2.50.

Farmer's Girl is a book with backbone. It is an excellent account of the English Farm front during the first two years of the war, but it has a somewhat deceptive title, for it is the story of a girl on a farm who works, not with her hands, but with her head.

Now that the production of food is assuming such enormous importance in the winning of the war, this book is all the more timely, for it tells the story of a young business woman who helps run a large truck farm in Norfolk. When her London job folds up at the beginning of the war, she answers an advertisement that lands her on a big farm whose owner is a prisoner in Germany. She has to keep the accounts and act as a kind of liaison officer between the owner's brother in-law, who runs an adjoining farm, and the new steward who until recently had been head teamsman.

Each field, as she describes the land and the people who work it, has its own name and personal characteristics, as much as the men who labor there, and vastly more than the machinery they use. She learns for the first time to keep an eye on that imponderable factor, the weather—to honor and nurse each field and its crop according to whether there is drought or rain or snow.

Bombs fly overhead, evacuées are taken care of, an occasional army maneuvre disturbs a newly seeded field. There is plenty of realistic drama. Gradually more and more men are called away - the men who have always lived and worked here. The book closes on the note that Land Army girls may soon come in to keep the farm going, to supply food for the big markets of England.

Although our local conditions in the United States may be somewhat different, there is a great deal that we can learn from this book and apply to our own farm problems at this particular time.

AMY SPINGARN,
Troutbeck, Amenia, N. Y.

Enjoyment of Fruit And Technique of Its Culture

DECIDUOUS ORCHARDS. W. H. Chandler. 438 pages, illustrated with 109 engravings, indexed. Lee & Febiger, Philadelphia, 1942. $4.50.

"The amount of pleasure derived from eating a fruit may be determined in large part by the physical nature of the cells of that fruit. When the fruit is being chewed, large, thin-walled cells are more apt to be ruptured and to have their flavored juices released than smaller, thicker-walled cells." This statement is unusual, yet informative. It is typical of many scientific explanations that are packed into the outstanding chapter entitled The Mature Fruit.

Professor Chandler explains much cultural detail about the apple, pear, plum, apricot, almond, peach, and cherry with an approach that is likely to be too scientific for some fruit growers. He includes valuable information about trees that are uncommon in the East; the mulberry, fig, persimmon, northern papaw, pomegranate, jujube, walnut, hickory, pecan, hazelnut, filbert, chestnut, tung-oil and pistachio—and designates the preferred latitude for each of them.

Many research botanists and technical orchardists will be glad to use this book as a reference. They will value it for its physiological explanations of tree behavior as a result of varying orchard techniques.

DONALD P. WATSON,
State Institute of Agriculture, Farmingdale, N. Y.

Growing Herbs of Our Own

HERBS, Their Culture and Uses. Rosetta E. Clarkson 224 pages, indexed and illustrated by Tabea Hoffman. Macmillan, New York. 1942. $2.75.

In her introduction Mrs. Clarkson reminds us that imports of herbs have ceased and that reserves are rapidly dwindling. It behooves us gardeners then either to be about the business of starting an herb garden or, in the case of one already growing, to replenish and to use what is growing there. She tells very clearly and concisely just how to do that very thing. To grow the annuals in a separate space and to have all the culinary herbs near the kitchen, to mention only two, are very practical and sensible suggestions.

In the uses of herbs she dwells at some length on the culinary end. This part of the book is full of appetizing suggestions and recipes. Particularly helpful should be the nine herb mixtures and their uses.

The tabular paragraphs on 101 useful herbs should prove of great use to the gardener for reference. They are accompanied by charming and accurate individual illustrations, which are a delightful reminder to those already familiar with them and a pleasing introduction to those about to make their acquaintance. To them especially I recommend this book.

ELSIE UNDERHILL GREEN,
Hillsdale, N. Y., Garden Club.

Beginner's Progress

THE GARDENER'S THIRD YEAR. Alfred Bates. 310 pages, illustrated, indexed. Longmans, Green & Co., New York, 1941. $2.50.

Alfred Bates in his latest work, "The Gardener's Third Year," has broadened the field of instruction in gardening for young people which he began and carried forward in his two previous works on the gardener's first and second years.

The first work discussed in an elementary way the principles of plant growth, and began the instruction in actual gardening with annuals. The second work dealt mainly with perennials and year-around care of the garden.

The new book, however, takes on a more ambitious aspect, not that it is out of step with the plan of progression laid down in the previous works, but rather that there is an over-abundance of factual information, a presentation of too many ideas at once. The constantly changing descriptive picture would be confusing to the young mind. The many details of the types of gardens described seem a little too advanced for the kind of youngsters for whom the book is intended.

The information in itself is sound and reveals a good grasp of the practical side of gardening, but the book might better serve its mission in the hands of a teacher with a practical background who could guide the young gardener in his interpretation of the matter presented. Thus would the work fulfill the very laudable purpose that prompted its writing: the stimulation of gardening among young people.

P. J. MCKENNA

A Miracle Has Happened

ORNAMENTAL AMERICAN SHRUBS. William R. Van Dersal. 380 pages, illustrated, indexed. Oxford University Press, New York, 1942. $4.

At last an American author has produced a book on native shrubs which is almost monumental in character. Never before has such a complete evaluation been made of the cream of American shrub society. It will probably be astonishing news to many an American gardener and landscape architect that we have within the bounds of our country thousands of shrubs fully equal to the finest of the ones from afar, and each already acclimated to one part or another of the United States, with many possibilities of growing in other parts, given the proper conditions. On the other hand, it is difficult to persuade the American interested in gardening that the home product is as good as that of any foreign clime—it is against human nature not to want the exotic rather than the more familiar. Dr. Van Dersal has written in a very knowing and persuasive way and this reviewer ventures the guess that many eyes will be opened to our own plant material if they will but start reading this book—for it is impossible for a true plant-lover to lay it down until it has been thoroughly read, reread and then digested.

E. J. ALEXANDER.

A Botanical Tumult

AN INTRODUCTION TO THE PLANT SCIENCES. William C. Darrah. 332 pages, illustrated, indexed. John Wiley & Sons, Inc., New York, 1942. $2.75.

The suspicion begins to dawn that, after all, it does not matter what one teaches the freshmen, or how. At any rate, here is one more text, not very different from most of its predecessors; certainly not an improvement. Professor Darrah's stated object was "a book not exceeding in total length half that of any of the standard full year textbooks" Yet in these 332 pages he has included every topic one can find in larger books and a few more. The most readable part is the first few pages, which present the growth and meaning of biology. Then one is plunged into colloid chemistry, metabolism, osmosis, and the like—a torrent of information in which I confess to being unable to find any clear intel-

lectual thread. The chapter on the cell may serve as typical: it covers the discovery of cells, their structure, absorption, metabolism, colonies, abiogenesis, and microtechnique in 9 pages,. with an average of 25 new technical terms per page

The author's opinion that the book probably contains errors is substantiated by even cursory reading. Perhaps the most surprising is figure 9, which illustrates a cystolith but is labeled "cell with latex"; it bears no discernible relation to the text. Nor are the errors all trivial Protein synthesis is not limited to photosynthetic tissue; chemical energy is not identical with potential energy. The parenthetic statement that vitamin B_1 "is of some interest to botanists because it plays a part in the formal formation of roots in many plants" scarcely exonerates the author for failing to discuss the basic importance of this class of substances. Perhaps its unreliability is the best argument against this type of book; in a condensed treatment it is more difficult to attain accuracy

The figures are mostly diagrammatic and many are technically inadequate.

H. W. RICKETT.

Pocket Guide for the Far West

CONE-BEARING TREES OF THE PACIFIC COAST. Nathan A Bowers 169 pages, illustrated, indexed Whittlesey House (McGraw-Hill Book Co., Inc.) New York, London. 1942. $2.50.

A convenient sized, durably bound pocket manual designed for field use, containing a somewhat unorthodox but seemingly quite functional set of "keys" for the identification of the gymnosperms of the Pacific Coast states. Identification of unknown trees is to be accomplished through a series of eliminations successively based on (1) needle characteristics, (2) approximate elevation of site, (3) geographical location, and (4) description and the accompanying illustrations. The index, which utilizes alphabetical guide letters rather than page numbers is equally as unorthodox as the identification keys; it is the belief of this reviewer, however, that the amateur will welcome and profit by these simplifications The illustrations, both photographs and drawings, are extremely well chosen and surprisingly complete.

CHARLES L. GILLY.

Brief Reviews and Notes On Recent Books

The Fruits We Eat And Where They Came From

FRUITS OF THE EARTH. Jannette May Lucas. 72 pages, illustrated by Helene Carter indexed. J. B Lippincott Co., Philadelphia. 1942. $2.

Helene Carter's picture maps showing, in this new book, the origins of the principal fruits of the North Temperate zone (as she depicted the native homes of our garden flowers in an earlier work) are unique and noteworthy. Her color illustrations and crayon drawings of the fruits and the flowers which precede them are also beautifully done. To accompany them, Miss Lucas has written a text describing the fruits, their history, and their classification in a manner with which no scientist can quarrel, and which any layman, young or old, can read with pleasure.

Gardens In Color

THE PICTURE GARDEN BOOK. Richard Pratt 143 pages, illustrated with color photographs by Edward Steichen, indexed Howell, Soskin, New York. 1942 $5.

Knowing the excellence of Edward Steichen's photographs, one wonders if he is not disappointed with some of the difficult yellows and greens and reds that are not quite true in the reproductions. The book is embellished with more than a score of photographs in color, which cover the season from tulips in spring to Christmas decorations. The text, which is an intimate report of gardening, embodying good advice with explanations of how to get the glamorous results shown in the pictures, makes rather pleasant and practical reading.

Forestry in England

THE SEASONS AND THE WOODMAN. D H Chapman. 79 pages illustrated by C F. Tunnicliffe, indexed Cambridge: at the University Press; New York The Macmillan Co, 1942. $1.75.

A forest in Great Britain is handled somewhat differently from a forest in the United States, and trees are different, too. Nevertheless, all have bark and leaves and buds, and there are enough similarities in the uses to which the wood is eventually put for this book to give an appealing picture to the boys of this country who are interested in forestry.

To those who already know a bit about such work in America, the book presents an interesting contrast with forests and forestry here. The decorative drawings are done in the style of woodcuts.

Pocket-Size Text

BACTERIOLOGY. William W. Ford. 207 pages, 8 illustrations, bibliography, index. Paul B. Hoeber, Inc., New York, 1939. $2.50.

A handy primer in the Clio Medica series published by the Medical Book Department of Harper & Brothers. Early observations and the work of van Leeuwenhoek are described; 18th and 19th century discoveries are touched upon, and the contributions of such men as Pasteur, Tyndall, Lister, von Nagele, Cohn, and Koch are made clear, the book concluding with a 20-page chapter entitled "Later Developments." A long bibliography is given for each chapter separately.

Why Is a Dog-tooth Violet?

THE COMMON NAMES OF PLANTS and their meanings. Willard N. Clute. 164 pages indexed. Willard N. Clute & Co., Indianapolis, Ind. Second edition, 1942. $3.

Stories of many of the curious names of plants, such as samphire, St. John's-wort, and dog tooth violet (member of the Lily family), of the 55 plants that are named for the devil, and of numerous plants named by or for the Indians of North America are told. Altogether about 600 common names, chiefly of wild plants, are treated.

The principal change in this new edition of Clute's familiar work lies in the changing of the botanical names to agree with Bailey's "Hortus II," which, because of the careful research which is known to have gone into it, is becoming more and more the accepted authority for writers on botanical subjects. Mr. Clute still, however, capitalizes geographical specific names—a practice long ago gone out of date.

Soilless Plant Culture

CHEMICAL GARDENING. D. R. Matlin. 163 pages, illustrated, indexed. Chemical Publishing Co., Brooklyn, N. Y., 1942. $2.25.

What looks like a second edition of the author's earlier book, "Growing Plants Without Soil," is in reality an entirely new volume, more practical than the first, more attractively printed, and with some of the irrelevant sections of the first book (such as a list of state flowers and tables showing the composition of various foods, including meats) eliminated in favor of information on the latest developments in soilless culture. In this new chapter, pumice is recommended as "an ideal growing medium for plants."

Monograph on Scale Insects Continued

ATLAS OF THE SCALE INSECTS. Gordon F. Ferris. Series IV. Serial Nos. 385-446. 62 plates. Stanford University Press, Stanford University, Calif. 1942. Unbound, $5.75, bound, $6.75.

The monumental monograph by G. F. Ferris on the scale insects of North America continues with the subfamilies Diaspidinae and Phoenicococcinae, which conclude the family Diaspididae. A general index to Series I—IV is included. Eighteen new species are included in the 25 genera treated. Greatly enlarged and minutely detailed drawings are accompanied by a page of description for each species. The plant host, habit, and known distribution of the species heads the descriptive comments.

The Rules of the Game

FLOWER ARRANGEMENT MANUAL. Matilda Rogers. Published by the author. 140 W. 69th St., New York. 1942. 25c.

A paper-covered booklet which boasts of its own uniqueness in not showing a single illustration, but rather letting the words, lesson by lesson, give the instruction.

SUNSET'S FLOWER ARRANGEMENT BOOK. Nell True Welch. 117 pages, illustrated and indexed. Lane Publishing Co., San Francisco. 1942. $1.

Fifty full-page photographs of unique flower and fruit arrangements, each one with diagrams and an explanation on the opposite page.

FLOWER ARRANGEMENTS IN VIRGINIA. Emmi F. Farrar. 164 pages, illustrated, indexed. The Dietz Press, Richmond, Va. 1942.

Each picture in this book is the contribution of a Virginia gardener, showing either a garden scene or an arrangement of garden flowers. Reproduction of the photographs is not as clear as one would like.

Photograph by courtesy of the Tennessee Department of Conservation

Cotton-picking in the South—a different picture from the one implied by Mr Crawford in his article this month on cotton as an ancient art and industry.

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Names of ornamental deciduous shrubs which appeared in the article by P. J. van Melle which ran in the Journals of December 1941 *and January and February* 1942 *are not indexed below as they have already been indexed completely in the February number. Topics and names which were mentioned in the Current Literature columns, also the names of visitors appearing in Notes, News and Comment, are not included here. A quick reference to these monthly departments in the Journal should bring the information desired. Books reviewed are listed by authors' names on the last two pages of this index. The letter "R" preceding a number indicates the Annual Report, which was issued as Part 2 of the June Journal and paged separately from the rest of the volume. An asterisk in the index refers to an illustration or to an illustrated article.*

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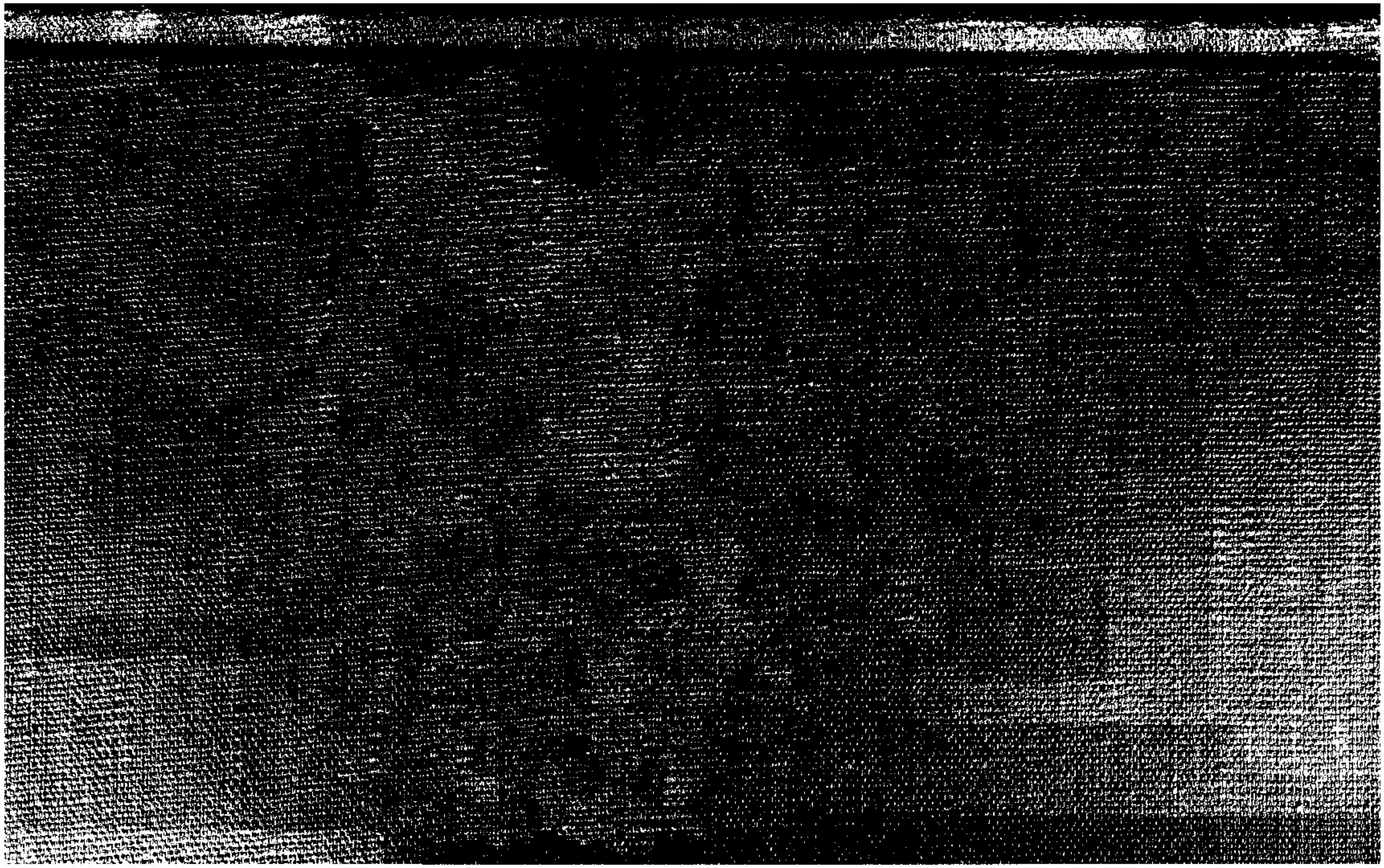
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